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The Bureau assumes no responsibility with regard to the opinions and the results of experiments published in the Bulletin.

The Editor's notes are marked (Ed.).

FIRST PART.
ORIGINAL ARTICLES

Agricultural Education in the Argentine Republic

by

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I. PRESENT ORGANIZATION

Agricultural education in the Argentine Republic may be classified under three heads: 1. Higher education given in the Universities; 2. Medium, elementary and continuation education provided by the Federal Government; 3. Agricultural education provided by some of the provinces and by special institutions or by national institutions connected with the above organization.

Higher university education. — This is given by the faculties of Agriculture and Veterinary Science, which form part of the National Universities of La Plata and Buenos Aires. The first of these two faculties was founded in 1833 in the present School of Agriculture and of Animal Husbandry at La Plata, which is now a practical school of agriculture annexed to the same institute. The second, situated in the neighbourhood of Buenos Aires at a place called "La Chacarita", was founded on September 25, 1904. Both faculties include two sections, one for agricultural engineers, the other for veterinary surgeons. The programme is a four years' one. For the possession of the degree of "bachelor" granted by the National Colleges is required; failing this the candidates have to pass an examination equivalent to the above courses. The La Chacarita faculty differs from the one at La Plata in that it has organized arrangements for boarding the students and will be inaugurated in 1914. The teaching staff at La Chacarita is to a limited extent composed of agricultural engineers and veterinary surgeons, while at La Plata almost all the professors hold such diplomas. Both institutions are endowed with laboratories and museums which compete with the best of the kind, and the cultivated lands and experimental fields that surround them are such as to meet all educational re-

quirements connected with the extensive type of agriculture prevalent in Argentina.

Most of the young men who take their degrees at these institutes find immediate employment in the national and provincial services, requirements of which in this direction are always increasing. Some are engaged as managers of private undertakings and others again manage their own estates.

Secondary elementary and continuation education. — As has already been stated, the vast organization that includes all the institutes of this kind is under the control of the Federal Government, through the Ministry of Agriculture, of which one division called "General Board of Agricultural Education" directs all these services.

The General Board of Agricultural Education was constituted in 1911. It develops an organic scheme of education which includes:

- a) — Practical instruction given in the District Practical Schools scattered over almost the whole of the country.
- b) — Special or technical instruction given in the Special Schools.
- c) — Continuation courses entrusted to local agronomists and other subordinate officials distributed in the most important agricultural live-stock breeding districts.
- d) — Experiment fields and experiment stations attached to practical and special schools.
- e) — District nurseries, devoted to the production and selection of forest and orchard plants and to their distribution in their respective districts.

a) — *Practical schools.* The instruction imparted by these schools and by the special schools is free of charge. It is local, in as much as it is restricted within the limits of the produce of each belt; it is specially directed especially to that branch of agriculture or industry which characterizes the district in which the school is situated. These schools have adopted the system of lodging and boarding their pupils, who live common with their professors and thus enjoy all the advantages of the boarding-school system. The following are the eleven schools of Agriculture at present existing in the Argentine Republic:

1. — Dairy school at Bell Ville (Cordoba).
2. — Agricultural school at Bella Vista (Corrientes).
3. — Pomological school at San Juan.
4. — Subtropical school at Posada (Misiones).
5. — Forestry and industrial crops school at Colonia Benitez (Chaco).
6. — Agricultural school at Las Delicias (Entre Rios).
7. — Agricultural school at Puerta de Diaz (Salta).
8. — Agricultural school "25th of May" (Buenos Aires).
9. — School of agricultural mechanics at Bahia Blanca.
10. — Market-gardening and fruit-growing school at Tigre (Buenos Aires).
11. — Dairy school at Olavarria (Buenos Aires).

The Tigre, May 25th, and Olavarría schools will be in working order 14.

The practical schools do not follow a systematic plan as it is usually stood; the curriculum is determined by the kind of production that school will choose during the scholastic year. The practical agricultural schools are organized in the same way as a model private farm and aim at obtaining the best and most abundant product at the least possible cost and in such a manner as to allow the pupils to have a clear idea of the results obtained by the systematic methods adopted by the school. The practical schools have the object of forming employees capable of carrying out the special work performed in the schools, and the theoretical part of the teaching is limited to pointing out the reasons of the practical processes at the moment in which the latter are applied. The pupils are all males; the courses last three years (six half-years); the instruction, including lodging, clothing, etc., are all free of charge. The school of agricultural mechanics at Bahía Blanca not being provided with the necessary installation for boarders, gives its pupils equivalent allowances.

In order to stimulate the students' activity they are granted a daily remuneration of $10\frac{1}{2}$ ¢, 15 ¢ and 15 ¢ during the first, second and third year respectively; this remuneration may be diminished for bad conduct or for insufficient application to study (the students must justify all the practical work done in the institution).

Besides, to encourage thriftiness, savings banks have been opened in the practical schools.

At the end of the courses the students get a diploma certifying to their competence in the special branch which they have studied. This diploma is not available in competitions for public employments because the object of these institutions is to turn out good and capable agriculturists. The schools also try to find situations for their pupils in the district, furnishing all the necessary information and proposing those candidates that are most suitable for capacity and morality.

The school half-years embrace the periods of the greatest agricultural and industrial activity; there are two yearly vacations of 15 days each; the working hours are the same as those adopted in private establishments; the time spent in the classes does not exceed one hour per day and is used to take notes and to prepare the calculations and the drawings necessary for the operations of farming and industrial practice.

For admittance to one of these practical schools the following are the requirements: Age: above fifteen (birth certificate). Health and physical fitness suitable to the special work to which the pupil intends to devote himself (medical certificate). Reading and writing correctly and a knowledge of the four fundamental operations of arithmetic. For this, examinations will be held between the 1st and the 6th of January in the school or elsewhere according to instructions. Applications are received between the 1st and the 15th of December.

b) *Special or technical schools.* — The special schools are also located in the country, and they not only train their pupils in one given branch of agriculture, but they endeavour to develop in them a commercial spirit by making them assist in all the operations connected with transactions over the products of the establishments, thus contributing to form their individual judgment. These schools, like the preceding ones, are boarding schools. In the school for vine-growing and wine making at Mendoza the boarding system has not yet been adopted on account of the required premises. Not more than 25 pupils are admitted at a time in order to have full efficiency of instruction. The school year begins on March 1 and ends on December 31, with two months vacation.

In order to be admitted to the special schools the following conditions are required: 1) Age, not less than 17 years (certificate of birth or equivalent document); 2) Health and physique suitable to the work they will have to perform (medical certificate); 3) Certificate of having passed the fifth class of the communal schools or passing an equivalent admission examination.

Free places are granted to Argentine candidates who comply with the above requirements and satisfactorily prove that they are not in a position to meet the necessary expenses.

The pupils are boarders, except at Mendoza; they may be paying pupils or free of charge. The former pay £ 8 15 s per quarter, payments in advance. Those who obtain the free places are boarded, lodged, clothed, etc.

The Mendoza school disposes every year of 25 free places or scholarships of £ 4 7s 6d, which sum is paid in cash. The other schools grant scholarships in proportion to the merits of the students and to the finances of the institution. The expenses due to those who have free places form part of the general expenses and of the working expenses appropriated in the budget. The scholarships are only granted to Argentine subjects in straitened circumstances and, other conditions being equal, the sons of farmers and people engaged in industry are preferred.

The special schools open at present are the following:

School of vine growing and wine making at Mendoza; School of fruit growing and sugar making at Tucuman; School of agriculture and animal husbandry at Cordova; School of agriculture at Casilda (Santa Fé).

The Casilda school is an intermediate type between the special and the practical school. The pupils who leave it bear the title of farm managers (Administradores Rurales).

The vine-growing school of Mendoza possesses vineyards and a model cellar. It gives the diploma of vine grower and oenologist. The curriculum extends over three years besides a preparatory course.

The courses at the school of agriculture and of animal husbandry at Cordova have the same duration. The students on leaving get the title of experts in agriculture or animal husbandry. They can then follow the higher courses at the National Faculties of Agronomy or Veterinary Science.

At the Tucuman school of pomology and sugar making the courses extend over four years, the first of which is preparatory; then come two years

general study and one of special study in the sugarcane industry. On completing the students get the title of experts in fruit growing and sugarcane growing. In order to increase the practical efficiency of the training, a factory for the extraction of sugar from sugarcane is being erected at the present time.

d) *Continuation education.* — This instruction is imparted by local agronomists. The Republic is divided into twenty districts, to each of which one of these agronomists is appointed. This official has the duty of spreading among the rural population of his district instruction about the crops, for the benefit of the men, women and youths who cannot follow the regular school courses. These local agronomists, assisted sometimes by a subordinate staff, conduct temporary courses, travelling lectures, cooperative experiments, and demonstration trains. The temporary courses are held for the children attending the primary schools, for adults and for soldiers. During the vacation the schools of agriculture organize short courses on special subjects.

Several railway companies have placed special trains at the disposal of the district agronomists, who give lectures, information and advice in these special trains, as well as in ordinary trains, in farms and on the premises of agricultural associations.

The cooperative experiments are intended to improve local production; to extend the field of action of the experiment stations and of the schools of agriculture to those localities which lack such institutions, and assist in carrying out and demonstrating the experiments made in them. The experiments are conducted by the co-operation of the State with private persons as numerous as possible in the area entrusted to each district agronomist. They are a happy combination of official and private initiative and fully justify their title, because the State supplies the seeds and the technical management of the experiments, whilst the other party provides the soil, labour and other necessary factors. This organization is completed by the continued and persevering assistance of the General Board of Agriculture. Education in all the competitions and shows (national, district and local) which take place in the district, and by the stimulating action of the institutions under the Board on everything connected with the founding and organizing of societies, syndicates and agricultural co-operative associations.

e) and f) *Experiment stations and district nurseries.* — These institutions must also be mentioned for their importance and because they complete the whole system of agricultural education. The experiment stations, like the experiment fields are attached to the schools, are provided with a special staff which teaches the pupils experimental methods. They are complementary to the schools both from their position and from their administrative dependence: they are in fact placed under the scholastic discipline and employ in their work the same means and the same factors, at the same time that they enjoy a complete scientific independence as to their researches. There exist also other experimental institutions of recent origin under the Board of Agriculture and Agricultural Defence.

(Dirección de Agricultura y Defensa agrícola), which forms another division of the Ministry of Agriculture.

The technical experts of agricultural education, considering experimentation as inseparable from tuition, constantly demand unity of action, vindicating their tradition as initiators of experimental research in the country.

Agricultural education possesses also some special establishments called district nurseries, devoted to experimentation and more particularly the multiplication of forest plants. Thanks to these establishments and in proportion to the progress of the buildings, rural organizations and agricultural improvement of the soil, the Board forms gradually a new model suitable to the institution of a new school according to an established plan. Some of these establishments have been placed under the control of the Board of Agriculture and Agricultural Defence.

Such is the national organization of agricultural education under the Ministry of Agriculture. It forms a harmonious whole which renders valuable service to the progress of Argentina and to the unceasing development of the agricultural industries of the country.

II — COMPLEMENTARY ORGANIZATION.

a) *National institutions with agricultural sections.* — In order to complete the review of the national agricultural education, notwithstanding the fact that the principal character of the following institutions is different from that of the schools of agriculture, it is worthy of note that agricultural instruction is imparted in the Reformatory at Marcos Paz (Province of Buenos Aires) under the control of the Ministry of Public Instruction, and that agricultural work is carried out at the lunatic asylum called the Open Door near Lujan (Prov. of Buenos Aires).

b) *Agricultural education in the provinces.* — The Province of Buenos Aires has possessed for the last two years the School of Pomology at Dolores. Its organization and working are very similar to those of the national practical schools. It disposes also of two important nurseries, situated at Baderero and Cazon.

The Province of Entre-Ríos has founded and maintains five schools.

1. The "Alberdi" Normal School for Rural Schoolmasters, situated near Paraná, the capital of the Province. — 2. The Agricultural, Animal Husbandry and Industrial School at Villa Urquiza, also near the capital. — 3. The Don Cristóbal Agricultural School (District of Nogoyá).
4. The "General Urquiza" Agricultural School (District of Villaguay).
5. The Agricultural School at Concordia.

The courses in these schools extend over three years.

The "Alberdi" school prepares rural teachers for the elementary school in which notions of general and special agriculture, of animal husbandry and of agricultural industries are given. The other schools turn out farm bailiffs and industrial foremen.

The Province of Santa Fé has instituted experiment fields in the district of Frigorifera, where varieties of cereals and forage plants are experimented; it possesses also an experiment and demonstration field at the rural school of Godoy.

The Province of Córdoba has founded an agricultural office for the spread of notions of agriculture by means of departmental agronomists.

The Province of Mendoza has possessed for some years a Practical School of Agriculture at San Rafael.

c) *Special institutions for agricultural education.* — In the Argentine Republic there are also schools of agriculture kept up by private associations or by religious corporations; these schools have in part the character of refuges for abandoned children.

Special mention must be made of the "Nicanor Ezeiza" Practical School of Rural Industries, founded by a group of inhabitants at Coronel Pringles (Prov. of Buenos Aires). This school is subsidized by the Government of the Province and will probably soon belong to it. It disposes of an estate of 617 acres with garden, nurseries, courts, pigsties, lucerne fields, etc., and it soon will have a butter and cheese dairy and a herd of 50 cows.

The school has been open two years, and its nurseries have already produced about 50 000 forest and fruit trees and during the year the number will reach 100 000.

The "Patronage for Children" maintains at Claypole (Prov. of Buenos Aires) an agricultural school with upwards of 200 children.

The Basque scholastic institution "Euskal Echea", founded by the Basque community for the education of Basque Argentine children, possesses an agricultural school at Lavallol (Prov. of Buenos Aires) in an estate of 100 acres in extent. The school is managed by Capuchin fathers, who give the children elementary education and a course of agricultural theory and practice divided into four years.

The Salesian fathers control four important establishments in the Republic:

1. "Don Bosco" agricultural school at Uribelarrea (Cañuelas, Prov. of Buenos Aires) with 1062 acres of land. It keeps 40 pupils. — 2. "San Pedro" College at Fortín Mercedes (Río Colorado), 97 miles from Bahía Blanca, has 100 pupils. — 3. "Don Bosco" School of vine growing and market gardening at Rodeo del Medio (Prov. of Mendoza), with 100 pupils. — 4. "San José" agricultural school at Roca (Río Negro), which occupies 15 acres of irrigated land and teaches upwards of 50 pupils.

The Salesian fathers possess at Bernal (Prov. of Buenos Aires) 50 acres devoted to experimental cultures and to the production of fruit.

The "Niño de Dios" agricultural and industrial school at Victoria (Ensenada) is managed by Benedictine fathers and disposes of 840 acres.

The Present State of Irrigation in Germany

by

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Up to within the last few years, irrigation in Germany was limited to water meadows, of which the oldest records date back to the 16th century. Though for several decades information on the irrigation of fields and gardens in other countries awoke a certain interest, nothing was done in this matter because the returns from the land without irrigation were satisfactory and because the rainfall in Germany was considered sufficient to ensure full crops. While irrigation flourishes principally in those countries where the yearly rainfall does not average more than 250 mm. (10 in.) and is moreover unfavourably distributed in the course of the year, Germany has no part of its territory that gets less than 400 mm. (16 in.), and of this quantity a great part falls during the time that plants grow (summer). Nevertheless it is not only the question of the total amount of rain occurring in a length of time, but also that vegetation should be spared periods of drought, even if these be only temporary. Already Hellriegel had shown by means of pot experiments how injurious to the crops are temporary spells of drought are, in spite of subsequent abundance of water. Still more conclusive are the results of lysimeter experiments which indicate the amount of water required for the production of 1 lb. of crop of dry substance, and compare the quantity of water required for the production of a good crop with the rainfall. The figures thus obtained are not truth distant from each other. Thus, for instance, much larger quantities are required when water is given in excess or when irrigation is practised with insufficient manuring. The limits are not too far apart when the consumption of water required for the production of the heaviest crop, if sufficiently manured, is considered per unit of water (2); this must be the aim of the whole irrigation problem.

The Kaiser Wilhelm's Institute of Agriculture founded at Bromberg in 1906, and especially its section devoted to land improvements, considers it one of its chief duties to study the water requirements of field crops and consequently the profitableness of field irrigation.

By means of the lysimeter experiments carried out there, it was found that the total evaporation from plants and soil during the period of vegetation in relation to the rainfall stood as shown in Table 1.

(1) HELLRIEGEL: *Grundlagen des Wasserbaues*, p. 452 II.

(2) *Mitteilungen des Kaiser Wilhelms Instituts zu Bromberg*, I, 373; II, 163; III, 17 IV, 118 and 132; V, 210.

TABLE I.

Year	Crop	Months								Total	
1909	Oats	IV		V		VI		VII		IV to VII	
		mm.	in.	mm.	in.	mm.	in.	mm.	in.	mm.	in.
		51	2.00	5	0.20	43	1.69	65	2.56	164	6.45
Irrigation	—	17	0.67	73	2.87	206	8.10	162	6.97	458	18.02
1910	Rye	IV		V		VI				IV to VI	
		mm.	in.	mm.	in.	mm.	in.			mm.	in.
		33	1.30	64	2.51	109	4.29			206	8.11
Irrigation	—	59	2.32	158	6.22	148	5.83			365	14.37
Rainfall	—	34	1.34	48	1.89	58	2.28	65	2.56		

The last line of the above table represents the average rainfall for Bromberg according to observations extending over upwards of 60 years, in which it appears that 1909 was a dry year and 1910 a wet one. But in both cases the amount of water required by the plants was considerably more than that offered by the rainfall, and in some months to such an extent that it is doubtful whether without irrigation the soil would have been able to supply the deficiency from its store (subsoil water), especially in soils possessing a low water capacity, which are the first to be considered for irrigation purposes. The results obtained in both years by irrigation remove this doubt. The unwatered plants were evidently injured by drought spells during which their need of water was not fully covered by the rainfall.

The same results were obtained in all the irrigation field experiments carried out at Bromberg. Even in the wettest years, to which especially 1912 belongs, there are some short periods of drought, and consequently irrigation proved beneficial, as may be seen from Table II.

In only two out of the six years during which experiments were made was the rainfall inferior to the average (205 mm. = 8.07 in.), and yet in 7 years considerable increases of crop followed upon irrigation. The results are higher than those obtained in similar experiments in America, especially if their higher market value in Germany is considered. There are in Germany, extensive territories which lie under the same climatic conditions as the experiment field at Bromberg; about 8150 000 acres with a yearly average rainfall of less than 500 mm. (about 20 in.), and even in these there are extensive areas with greater rainfall which yet suffer from frequently recurring shortage of rain. From the above it may be concluded that in Germany irrigation has a great future before it. There are, however, two circumstances which tend to act as limiting factors. One is that, according to experience hitherto gained, only light

TABLE II.

YEAR	Rainfall		Crop	Yield per acre				Increase per acre of watered plot *	
	IV-VII			dry plot	Watered plot			cwt.	£ s d.
	mm.	in.			cwt.	mm.	in.		
1907	298	11.7	Oats	12.74	115	4.5	19.11	6.37	3 9 10
1908	237	9.3	"	9.56	140	5.5	19.11	9.55	5 9 11
1909	163	6.4	"	11.95	140	5.5	24.69	12.74	5 19 0
1912	276	10.9	"	23.90	20	0.8	27.88	3.98	1 19 3
"	"	"	"	23.90	100	3.9	28.67	4.77	2 8 9
1909	163	6.4	Potatoes	136.20	110	4.3	258.07	121.87	7 11 2
"	"	"	(Starch)	22.30	110	4.3	47.79	25.49	
1911	105	4.1	Potatoes	62.13	280	11.0	209.49	147.36	
"	"	"	(Starch)	11.15	280	11.0	43.81	32.66	
1910	294	11.6	Winter rye	15.93	80	3.1	19.11	3.18	1 15 8
"	"	"	Spring rye	9.56	70	2.8	12.74	3.18	1 10 1

^a The cash value of the increase of crop was calculated at current market prices.

soils seem to be suitable for profitable irrigation, though it must also be noted that up to now irrigation experiments on heavier soils have been conducted to a very limited extent and require to be completed. A second obstacle lies in the extraordinary difficulties in the way of procuring the necessary water, because almost everywhere older rights are encountered; one might almost say that every drop of water is somebody's property and is not to be had without indemnifying the owner. Besides this, it is not everywhere that water is to be found within accessible distance of the fields to be irrigated. To a great extent this difficulty is met by providing subterranean water by means of wells, even this not easily available and expensive source is threatened, however, according to the new Prussian laws on water, an indemnity must be paid to neighbours who suffer any loss by the tapping of underground water, whereas formerly every landowner was absolutely free to use any subterranean water he found on his property.

While these difficulties are to be regretted, as there is no other utilization of water as profitable as that of using it for irrigating fields and gardens, circumstances must be taken as they are; and consequently

irrigation systems as allow of the smallest consumption of water have adopted.

Experiments made with wasteful furrow irrigation soon showed that it was too much loss of water by infiltration before it reached the places it was required. This system allows only of an unequal distribution of water and is applicable only in especially favourably situated localities. It remains then only sprinkling from above like rain. With this method there are losses, because the water adhering to the leaves and stems of plants is evaporated and almost completely lost as plant food. Still loss is relatively small, and sprinkling allows of a uniform distribution of water over the field without any preparation of the latter.

In order to apply this system of watering, the water must be sent to the field under pressure in pipes; by this means it can be sprinkled on the field so that it all soaks into the soil and none flows off the surface. On this point it has been found that the density of the rain must not be above 0.039 inch per minute, if this condition is to be fulfilled. In the installation of this kind — at Eduardsfelde near Posen — the town of Posen was used in this way and sprinkled by means of hose piping attached to the pipes conveying the liquid under pressure. This system requires much labour and has further the drawback that in sprinkling by means of a uniform distribution of the water is not attainable, and consequently the method is liable to be connected with waste of water (1). In view of the recognition of this fact, the mechanical distribution of water by means of moveable carts has been adopted; this method requires less labour to accomplish the same amount of work and does it uniformly.

At present three such systems are in use and they are named after their inventors: Hartmann, Von Szczepkowski and Rodatz. A full description of the details of each system would be out of place here, besides it has been given in other publications. (2). All three systems have given main satisfaction. The injury they have caused to the fields, if any, has been very small. If in their details there are still some weak points, these may be considered as trifling, due to the novelty of the thing, and will be soon overcome. To this end a prize offered by the "Deutsche Landwirtschafts Gesellschaft" will contribute greatly.

Besides these three systems of portable apparatus, two systems of fixed apparatus for the watering of gardens are to be mentioned: one by Herr Rodatz, Civil Engineer (Berlin) and the other in use at the seed-breeding station at Quedlinburg. The cost of an installation for watering fields is considerable and so is its working. The greater part of the expense is represented by the costly iron pressure pipes. When these are fixed and laid on the ground the complete plant costs from £ 8 to £ 10 per acre,

Mitteilungen des Kaiser Wilhelms Instituts, V, 220.
Deutsche landwirtschaftliche Presse, 1912, Nos. 3 and 4; *Veröffentlichungen der Oesterreichischen Gesellschaft in Dresden*, 1913; *Mitteilungen der D. L. G.*, 1913, Parts 7 and 18.
 No. 486, B. March 1912, where illustrations of two systems are given. — Ed.).

without the steam engine, which however need not be specially reckoned because most large farms possess one which is not required for other work when the time for irrigating comes round. Much cheaper than the steam engine, especially for large estates, are portable pressure pipes, which diminish the cost by about one-half. If the field to be irrigated is especially favourable by its form and situation as regards the water supply, the cost of installation can sink to £2 per acre and even less (1). Recently, also, reinforced concrete works have already been partially successful in their attempts to manufacture cement pipes reinforced with iron, able to stand high internal pressure. If they should succeed completely in producing a suitable substitute for the expensive high-pressure iron pipes, the cost of field irrigation plant would be very much reduced.

The average amount of water required for the intensive irrigation of the various crops may be assumed to be about 14 000 cub. ft. per acre per year. Recently the question has been much discussed whether extensive irrigation, that is for a given quantity of water irrigation of a large area with small quantities of water, is to be preferred to intense irrigation of a smaller area. It appears as if the decision will be in favour of extensive irrigation, as some experiments made in the United States have shown (2). Should this really be further confirmed, the cost of the water and of the labour per unit of area would be still further reduced.

The increases of yield obtained by irrigation on the experimental farms at Bromberg have not failed to draw the attention of practical farmers with the result that at present in the dry east of Germany already about 5 000 acres of arable land, belonging to 15 farms, are under irrigation. One estate has set up a plant for about 2 500 acres, with a central electric station to supply the necessary power. The attempt to sprinkle a meadow was followed by a great increase of gross returns, but by no means profit (3). Grass makes great demands upon the quantity of water. It yields a hay of relatively low value, which does not pay the expense of irrigation under pressure.

In general all the experiments made on the irrigation of various crops show that the net profit due to irrigation varies with the market value of the crop. Owing to this being recognized in Germany, the installations for the watering of orchards and market gardens are increasing in number. While market gardens can be treated by sprinkling, orchards do not do it well, as the fruit is liable to be damaged by it. Besides, sprinkling between the trees can be carried out only with difficulty even with a pump. It is therefore advisable to water orchards by furrow irrigation, as is done in the United States.

In conclusion it may be stated that at present in Germany also the interest in irrigation is widely felt, as the considerable application of it clearly shows. If recently complaints about the celebrated irrigation

(1) *Mitteilungen der D. L. G.*, 1913, Part 18.

(2) *Illustrierte landwirtschaftliche Zeitung*, 1913, No. 41. (See No. 228, B. March 1913.)

(3) *Mitteilungen des Kaiser Wilhelms Instituts*, IV, 123.

United States have reached us (1), we need not fear that any such untold surprises await our irrigation schemes, the composition of our soil and the method of sprinkling that has been adopted here being sufficient to meet the needs. But as has already been stated, the area of the land which can be irrigated is not large; consequently irrigation in Germany must ever have a great economic importance. Nevertheless, considering the success already attained, no favourable opinion for the installation of an irrigation plant should be neglected.

Seed Control in Austria and its Effect upon Agriculture and Trade

by

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Director of the Vienna Seed Control Station.

The beginning of the regulation of the seed trade in Austria coincides with the founding of the Vienna Seed Control Station in 1881 by the Imperial and Royal Agricultural Society of Vienna (K. K. Landwirtschaftsgesellschaft).

The chief aims of this station were not only the elaboration and improvement of the scientific methods of examination of the various seeds of commerce as to their quality, and the organisation of seed control in Austria, but also the carrying out of investigations and experiments in the cultural study of seeds, on forage growing and later on seed breeding, in connection with several field experiments on the agricultural value of the most highly advertised seeds placed on the market and sent in for analysis.

Owing to its present sphere of activity as an independent botanical examination station, the Vienna Seed Control Station has been taken as a model in the institution of similar stations elsewhere in Austria and abroad. It started 32 years ago with very modest beginnings and has now developed into an agricultural institute upon whose many-sided activity analyses are made, and which at present is the largest examination staff of the kind.

Up to the year 1886, the Seed Control Station was situated in one rented in a private dwelling, and limited itself to the examination of the most important seeds of commerce. At the initiative of the writer, since the foundation of the Institute has been connected with it, the station was transferred to the premises of the Imperial and Royal Agricultural Society and its activity was extended beyond the analyses of commercial seeds, in the new direction of experiments principally on food and cereal crops.

In 1895 the Station was taken over by the State and removed to building of the Ministry of Agriculture, where it remained until 1895, through the munificence of the Emperor, a plot of land about one in extent in the Prater was secured; on this a building for the station erected, surrounded by a garden suitable for small cultivation exper-

WORK OF THE STATION.

I. — *Examinations (analytical work).* — In the first place the determination of the practical value of the various seeds of commerce, their authenticity, genus and species, origin, dodder content, degree of purity in percentage by weight, germination capacity; further the water content (in the fruits and tubers). Then there are examinations of sugar beet and maize seeds as to impurities, germination capacity, number of clusters per grain etc.; and for cereals, the hectolitre-weight, the absolute weight of the grain, total weight and percentage of sprouted, broken, bruised, gnawed, smutted or ergoted grains; further, in the examination of bread cereals or of meal, the baking value is ascertained. Barley for the brewery is submitted to a complete analysis for water content, purity, hectolitre-weight, absolute weight, proportion of husk, mealiness, plumpness, grade, content of protein, purity of variety, proportion of damaged grains, germination capacity; and germination energy. The Station also examines *concocted foods* (bran, meals, oilcakes, etc.), and this not only to determine their purity or possible adulteration, but also (according to Weinzierl's mechanical and microscopical method) their meal and husk content; the colour of the meal is also determined with the object of judging its type. Last the Station determines the species of cultivated plants or weeds, investigates plant diseases, examines *hops*, carries out complete botanical analyses of hay and undertakes researches on plants and parts of plants of importance to agriculture.

No slight aid to the constant progress of the systematic cultivation of forage crops has been afforded by the Station during nearly a quarter of a century by its formulae for *seed mixtures* issued at the request of farmers for seed leys, permanent meadows, pastures, alpine pastures, etc.

Of great importance for regulating the trade in clover seed, especially as regards the essential quality of freedom from dodder, has been the practice adopted by the Station since 1882 of sealing with leaden seals the sacks of seeds in the merchants' warehouses. This practice is a speciality of the Station and has been followed by other experiment stations.

As for the use made of the Station by the public, it need only be stated that in the year in which it was founded the number of analyses carried out, including sealing of sacks, was 122, while last year (1912) the number rose to about 30 000.

In 1907 a branch station was opened in the Agricultural Exchange in Vienna; it was the first of its kind and proved to be a valuable adjunct. It is situated in immediate proximity to the common Exchange hall and is connected with it by means of a hatchway which allows people to

inge to submit the samples presented for sale to a summary investigation on the spot, and to get immediate results upon which commercial actions may be based.

[. — *Experimentation (field experiments)*. — Among the duties of the Control Station as an agricultural botany experiment station the following are the most important :

Encouraging the cultivation of forage plants by carrying out field experiments with them, installation of forage crop stations, cultivation and reeding of forage plant seeds, experimental growing of forage crops in the Alps. The last-named are made in the experiment garden on the Hohen Alpe near Bad-Aussee, and in other alpine seed gardens instituted by agricultural associations or by the authorities in Austria at the initiative of the seed Control Station ; further, since 1909 experiments have been made at the Imperial and Royal Kragl estate, near Mitterndorf ; reeding of grasses and pasturing, and plants useful as litter have been dealt with on special experimental areas.

Promoting the breeding and cultivation of cereals, flax, beets and potatoes, maize and forage plants, as well as plant breeding in general, by means of experiments intended for the improvement of the varieties of the country and for the breeding and spreading of new and better varieties on the one hand, and for keeping up the productivity of the existing varieties that have been introduced and found advantageous, on the other. Lastly, the results of these scientific and practical field experiments are made known by means of publications, lectures, courses and demonstration plots.

Stimulating the formation of organisations for the furthering of agricultural crop production, especially the raising and breeding of seed, on peasant farms or by agricultural associations.

Lastly, the furthering of the scientific bases of agricultural crop production in general, especially by means of scientific investigation in the study of the question of the formation of new plant forms in the most important crops, etc.

For carrying out small experiments of cultivating new varieties of cultivated plants, seeds of doubtful origin, breeding experiments, etc., the garden of the Station containing fifty plots, making together 1.827 acre, is available. For experimentation in winter there is a glass house built in 1907 in the garden of the Station.

METHODS OF SEED CONTROL.

With the object of obtaining uniformity in the methods of seed control in Austria, a special expert commission for seed control under the presidency of the writer was appointed under the Federation of Agricultural Experiment Stations founded in 1911. This commission drew up and published, in a book (1) dealing with the methods to be followed, the special

Methodenbuch. Niederschrift der für den Verband der landwirtschaftlichen Versuchsanstalten in Österreich ab 1. Januar 1913 geltenden analytischen Verfahren und Grundsätze. Published by the above Verband, Wien II., 1st. Edition with 9 figs. Vienna, 1913.

cial instructions which have been enforced since January 1, 1913, and which in their main lines are the following :

For every examination a small *average sample* is made up from the sample sent in.

The determination of the *authenticity* consists in determining whether the sample agrees with the designation given to it, as to genus and species. The authenticity of a variety is at the request of the sender to be determined by an experiment in the open.

The very various places of origin of the clover seeds found in the lots are to be indicated by one of the following fixed denominations : Central European, South European, West European, North European, East European, North American, South American, Asiatic and Australian.

a) European seeds whose origin cannot be ascertained for certain are to be designated as "European seed".

b) American seeds which cannot be recognised certainly as coming from North or South America are to be designated "American seed".

c) Seeds which are free from those characters which are considered typical of American seeds are to be designated "free from American characters".

d) Seeds which besides the characters of other origins contain those of American seeds are to be designated as "containing American characters."

e) Samples which are recognized without doubt as mixtures of various origins are to be indicated with the observation "containing".

In the *determination of purity* the following are to be separated : sand, stones, chaff, foreign seeds and damaged and shrivelled seeds of the variety in question in so far as these are undoubtedly incapable of germination.

Samples sent in for *examination for dodder* are to be passed through a suitable square-meshed sieve and both those which pass through and those which remain on the sieve are to be examined.

Any sample of clover, timothy or flax containing even only one sexually developed dodder seed is to be declared "containing dodder".

The number of seeds of "Kapselseide" and "Grobseide", as well as the number of seeds of clover dodder in the small-seeded clovers and timothy, are not to be indicated.

If on the subsequent examination of a parcel of seeds warranted dodder-free or of one sealed by the Seed Control Station, five or more dodder seeds per kilogram (2.2 lbs.) are found, the vendor is bound to take the seeds back again at the request of the purchaser. If less than five per kilo are found, the vendor must bear the cost of another cleaning of the seed.

The seeds for a *germination test* are counted out of an average sample which is taken at the same time as the sample for the determination of purity.

For the determination of *germination capacity* two parallel sets

are to be made, each with 200 good ("pure") seeds. For large (maize, beans, acorns, etc.) usually two sets of 100 each are sufficient. Several kinds of seeds are steeped before being put in the germinator. As germinating bed, filter paper, pure quartz sand and sterilized tin dishes are allowed. The moisture must not exceed 70 per cent. Filter paper and 20 per cent. with sand. Otherwise the optimum moisture depends upon the kind of seed and the germinating medium. Choice of the germinating bed depends upon the kind of seed to be

The paper germinating bed must consist of several sheets of sufficiently and absorbent filter paper laid over each other and so arranged as to permit the necessary access of air.

The daily amount of water is to be given by sprinkling the lowest layer of paper from a wash-bottle specially arranged for the purpose, directly onto the seeds.

The sand germinating bed, besides being used for beet seeds, is sometimes used also for the control of the experiments made with filter-paper pins, sainfoin, peas, beans and cereals. It is made by mixing clean sand with spring water, the quantity (1) of which is determined by the size of the grains of sand (2). The wet sand is placed in a suitable dish, then pressed with a marker which makes 100 small holes, in which the selected beet clusters are placed; the whole is then covered with a glass plate and glass cover.

The germinating beds, both paper and sand, containing the seeds are put in the Weinzierl germinating case, the former on strips of glass, latter on wooden laths, where the seeds that require it are submitted to intermittent temperature. Such are *Agrostis alba*, *A. vulgaris*, *Aira tenuis*, *Alnus*, *Alopecurus*, *Anthoxanthum*, *Avena flavescens*, *Dactylis*, *Betula*, *Daucus*, *Glyceria*, *Holcus*, *Nicotiana*, *Phalaris arundinacea*, *Strobilus*, *Poa* sp., *Zea*; these are kept for about 10 hours at 18° C. or 14 hours at 28° C. All other seeds are placed in an unheated germinating case at room temperature (15° C. or 20° C.).

In every germinating case with paper beds, care must be taken to provide fresh air, but this must be as moist as possible; it is best obtained by placing a tin vessel full of water on the heated bottom, and ventilating daily.

If gas heating is employed, Weinzierl's safety burner is useful; with electric heating, the best is a heater let into the bottom of the germinating case.

The temperature must be regulated by reliable automatic regulators. Whilst, as a rule, germination trials are carried on in the dark, parallel to diffused daylight are recommended for *Poa* spp., *Dactylis*, *Phacelia* (which require also a lower temperature, 15° C.), *Larix europea*, *Pinus sylvestris*, *P. maritima*, *P. Strobilus*, *Alnus* spp. and *Betula* spp.

1) 400 cubic centimetres.

2) 0.25 to 0.5 millimetre.

The most favourable result (if superior to the "dark" test) is taken as the final one.

On the process of germination preliminary communications may be made.

If deviations of more than 10 per cent. between the parallel tests observed, the test must be immediately repeated with 2×200 gr. In the case of cereals, lupins, sainfoin, peas and beans this is to be carried out with sand beds.

The number of sprouted seeds referred to 100 gives the percentage germination. In the case of lucerne one-half of the hard seeds, and the other clover seeds one third, has to be added to the number of sprouted seeds; but the actual results must also be given.

For forest seeds, on conclusion of the test the number of seeds that have not germinated but are fresh is to be specially mentioned in the report. For *Abies*, *Acer*, *Carpinus* and *Fraxinus* only the section is practised.

Limits of error (1).

1. For the practical value: 5 per cent.
2. For beet seeds the following rules are to be observed:

If a second examination of the same beet seed shows differences in some points and these differences lie within the limits of error of analysis, the two results are to be considered as agreeing with each other.

The limits of error of analysis are the following:

1. In water content 1 per cent
2. In the content in foreign matter and in the imperfectly developed clusters in results up to 3 per cent. 1
3. In the number of clusters per gram 5 per cent. In the germination capacity (seedlings and clusters capable of germination). 10

Subsequent control. — The purchaser must send to the Seed Control Station for further examination an average sample of the quantity, and in the presence of two witnesses and accompanied by the duly filled guarantee certificate.

The subsequent examination is to be carried out on principle of charge for the buyer of at least 5 kilos (11 lbs.) of goods from a seed led contract firm (Vertragsfirma).

The fee for the subsequent examination is paid as a rule by the firm amounts to 50 per cent. for the normal tariff; the same is the case also if the purchaser when he offers to bear the expense.

The right of the purchaser to claim compensation ceases:

a) When the sample is not sent in within 8 days from the date at which the goods were received.

(1) The limits of error are considered only for the published final results, while deviations allowed for the individual determinations are given in the descriptions of the methods of examination.

b) When the claim for compensation has not been made within 8 days of receiving the result of the subsequent examination.

In cases of differences being found, the amount of compensation is calculated on the basis of the guaranteed practical value and that of the seeds delivered, and taking into consideration the normal limits of value for all kinds of seeds with the exception of beet seeds, according to the formula:

$$Ab = \frac{Pr}{100 \times Gb} \times V \times Qu, \text{ in which.}$$

Ab = Compensation.

Pr = Price per 100 kg. (220 lbs.).

Gb = Guaranteed practical value.

V = Percentage to be compensated.

Qu = Quantity purchased.

For beet seeds the amount of compensation is arrived at by calculating so-called value index (Wertzahl according to v. Weinzierl) (1) as the entage ratio between the value guaranteed and that delivered.

Sealing with leads. — On principle the sealing of sacks is only done in permanent warehouses of the contract firms. In other places, such as public storerooms, railway premises, etc., it is done only exceptionally with the consent of the board of the Seed Control Station.

The clover seeds to be sealed must be put in seamless sacks and placed in stores free from dust, in such a way as to allow of easy access to officials charged with the sealing.

The sacks must then be closed by passing a needle and twine right through them at the spot where they are to be tied and then tying them at two or three times.

At the ends of the twine a label (Spitzzettel) which bears the same number as its counterfoil (Attest), is first hung and then they are closed with a leaden seal upon which the official dies impress the month and year on the side and on the other the Austrian eagle with the inscription "K. K. Seeden-Kontroll-Station in Wien".

An average sample is taken from different parts of each sack to be sealed and is put into a small, also seamless, bag, which is likewise closed with the Station's seal.

The examination of these samples is performed without exception in the laboratory of the Seed Control Station. The firm is immediately informed of the result and requested to remove the leads and labels from the sacks about which doubts arise and to send them by return of post to the Station.

As fit to be sealed, the Station considers only those leguminous seeds which have been found on examination to be "dodder-free" (2) and which

1) Cfr. v. WEINZIERL: Eine Wertzahl für Rübensamen. — Wiener landw. Zeitung, No. 75.

2) As "dodder-free" seeds to be sealed are considered only those which do not contain one single developed grain of dodder in the average sample taken from them.

present the appearance of being seeds capable of germination that have been cleaned with the best machines. Besides this only such red clover and lucerne seeds are admitted which are evidently not of American origin and contain no admixture of American seeds.

The origin of the clover seeds is not given in the sealing certificate and consequently a special written guarantee must be demanded from the vendor. An exception is made for those seeds which are recognised as Turkestan lucerne or South European red clover. These are for the present sealed, but on the certificate the origin is given.

In conclusion, and in order to give a clear idea of the whole work of the Vienna Seed Control Station as it is at present, it must be noted that it does not limit itself to the examination and analysis of commercial seeds, but as a natural complement of its control work it carries out field experiments, and scientific research on seed breeding, growing of grass seeds, and on the value of the different varieties of seeds put on the market; it thus acts as an agricultural botany experiment station (1), as is set forth in the second title which the Seed Control Station bears according to its statutes.

The Cattle Industry in Britain

by

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It is impossible accurately to trace the development of the Cattle Industry in Britain throughout any very long period of time, as accurate statistics are available only for the latter part of the previous century and for the present one. The only statistical statement of earlier times on which any amount of reliance can be put, is that of Davenant, published in 1688. Davenant estimated that there were, in England and Wales, four and a half million cattle, twelve million sheep, and two million swine. The population at the time was put, probably with a considerable degree of approximation at 5 $\frac{1}{2}$ million persons. There are, at the present time, in the same portions of the United Kingdom, about 6 million cattle, 19 $\frac{1}{4}$ million sheep, and 2 650 000 swine. Cattle have therefore increased, in the 2 $\frac{1}{2}$ centuries, by about 33 per cent., while the average increase of the three classes of meat-producing animals has been about 43 per cent. During the same period the population has increased about six and a half fold. It is probable that a greater increase in the live stock would be shown could Scotland and Ireland be taken into account.

(1) "Wirkungskreis und Dienstinstruktion" für die Abteilungen an der k. k. Samenkontroll-Station in Wien (approved by Order of the Ministry of Agriculture, No. 12 1908). Publ. No. 368.

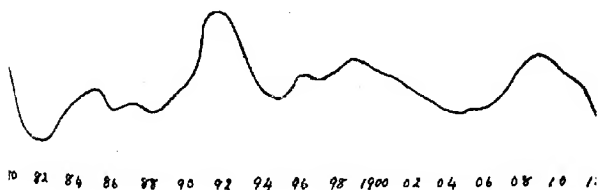
Since 1878, from which time accurate statistics are available, the number of cattle in the United Kingdom has increased from about 10 millions to almost 12 millions. This increase is shown by the accompanying chart (Fig. 1) in which the number is plotted for the 35 years in question.

45 NUMBER OF CATTLE IN THE UNITED KINGDOM 1878 - 1912.



The fluctuations are somewhat irregular during the first part of the period, but the second part of the curve shows a very steady upward tendency. This increase in numbers, however, has not been in proportion to the growth of the population, for in the same period the latter has increased from about $33\frac{1}{2}$ to about $45\frac{1}{2}$ millions. Thus an increase of 5 per cent. in the population has been met with one of only 20 per cent. in the head of cattle. At the same time cattle constitute the only part of live stock which have, as it were, made any attempt to meet the growing needs of the population. Fig. 2 shows the variation in the number of sheep during the period mentioned, and it will appear from that, while there have been somewhat rapid fluctuations in the number of this class of stock, there has been no marked or definite tendency either in one direction or the other.

NUMBER OF SHEEP IN THE UNITED KINGDOM 1878 - 1912.



The National herd of cattle has thus been growing fairly steadily during the last 35 years. At the same time we may trace from the statistics of the last 20 years, which are all that are available, a small but interesting change in its composition. The proportion of the whole

returned as "cows or heifers, in milk or in calf", has remained constant throughout, varying between 35.7 and 37.3 per cent., showing no definite tendency either to increase or to diminish. On the other hand, those grouped as "other cattle, 2 years old and over" have fairly steadily decreased, from 24 per cent. in 1893 to just under 20 per cent. in 1912. There is a corresponding increase in the proportion of yearling cattle and calves, the said increase being about evenly divided between the two groups. It is probable that the change in the cattle industry which these figures illustrate has continued for a much longer period than that for which figures are available, and has, in the past, been much more extensive than the figures show. There appears to have been a long-continued tendency to market cattle for slaughter at a diminishing age, which has probably lasted throughout a century or more.

It is difficult to decide from statistics what sort of change has occurred in the available supplies of food for cattle. According to the official estimates, there has been a considerable decrease in the national wheat crop in the past 35 years, from over 2.9 to under 2.6 million tons, or about 13 per cent. On the other hand the total area of pasture has probably increased very considerably up till about 10 years ago, since which time however it has shown a tendency to diminish. There has also, without doubt, been a very great increase in the imports of cakes and meal, especially for cattle feeding, although no statistics are available to show its extent.

The live stock industry of Britain is, of course, insufficient to supply the needs of the home population, whether for meat or for dairy produce or wool. At the same time the home production of meat bears a very much larger proportion to the total consumption than does that of grain. Mr. Rew has recently calculated that the country produces about 55 per cent. of its total requirements of meat, by weight, as against less than 20 per cent. in the case of wheat. Moreover, it is in the case of beef that the home production most nearly approaches the consumption, while the country as a whole produces slightly under 50 per cent. of the total requirements of pig meat, and only slightly over 50 per cent. of the consumption of mutton and lamb, the total home production of beef being slightly over 60 per cent. of the consumption.

There are sixteen well recognised British breeds of cattle, without counting separately the Lincoln Red and the Dairy sections of the Shorthorn, which have their own special breeders' associations. Of these five (the Ayrshire, Jersey, Guernsey, British Holstein, and Kerry and Devon) are special dairy breeds, while the others are classed as beef breeds or dual purpose breeds. The latter group includes the Shorthorn (with its two branches already mentioned), the Hereford, Longhorn, Devon, South Devon, Sussex, Black Welsh, West Highland, Galloway, Aberdeen-Angus and Red Poll. The majority of these breeds, whether we consider pedigree herds or ordinary commercial breeding herds, are fairly strictly local, being confined to those parts of the country included in, or adjoining, the counties or districts by which the breeds are named. Others, such as the Aberdeen-Angus, Jersey and Guernsey, while still commonest in their

districts, are widely distributed over the country generally. The horn is of course at once the commonest and the most widely bred breed.

Each of these breeds has a special association of its breeders, which goes over its interests in many different directions. Chief among the activities of these societies is of course the compilation and publication of a pedigree book. The advantages, as well as the *modus operandi*, of the ordinary system of registration are probably sufficiently well known. Some British pedigree books are "closed"; that is to say no animal may now be entered in them unless it be the progeny of registered parents on both sides. Others are "open", and accept for registration animals which have at least a minimum proportion of their ancestors registered. The latter system makes it possible for a breeder gradually to render his cattle eligible for registration by the continued use, through three or four generations, of pedigree bulls, and without necessitating the purchase of pedigree females. Pedigree breed societies endeavour to forward the interests of their members by holding special auction sales of stock, and in particular of young bulls. Examples of such sales are those of Herefords at Hereford, of West Highland cattle at Oban, of Devons at Taunton and Exeter, etc. Most of the societies also offer medals and prizes for their respective breeds at live stock shows, both at home and abroad. Other and various methods of improvement are employed from time to time.

Most important of the remaining associations in connection with the cattle industry are the milk record societies. Up till ten or twelve years ago Britain was far behind many other countries in the matter of record keeping, but since that time very rapid progress has been made. In the Herefordshire district for example, where the work commenced as late as 1903, there are already 24 societies in existence and in 1912 records were kept of 438 herds, and of 18 356 individual cows. The societies are co-operative, but are supported by grants from the Highland and Agricultural Society of Scotland, the Ayrshire Cattle Society, and now also by Government. Testing, both with regard to quantity of milk and to percentage of butter fat, is carried out in each herd about every 21 days. As in Ireland, where an excellent system of Government assistance for stock breeding has been in force for a considerable time, no extensive work has been made by Government for the encouragement of cattle recording. A scheme has however been published in the present year whereby, among others, a grant of £5000 yearly will be available for the purpose of subsidising milk record societies, and one of £13 800 for the selection of pedigree bulls.

Live stock shows have been developed in Britain to an extent which is probably unparalleled in any other country. Besides the large exhibitions annually by the Royal Agricultural Society of England, the Smithfield Stock Club, the Highland and Agricultural Society of Scotland, the Dublin Society, the Bath and West of England Society, etc., there are innumerable district, county and local shows. Their influence, both in

the direction of encouraging enterprise in breeding and in that of educating the ordinary farmer, has been enormous.

A well-developed system of auction sales also exists, which acts greatly to the benefit of breeders by facilitating the choice of breeding animals. Sales of cattle are held in connection with the Royal and Dublin shows; others are organised, as already mentioned, by breed societies and other and very large sales of particular breeds are held by private persons or by auction companies. Among the latter, those of Shorthorn and Angus cattle at Perth, and those of Shorthorns at York and Birmingham are the most notable.

There is, as is well known, a large export trade in pedigree cattle from Great Britain. During the five years 1906-10 inclusive the annual exportation averaged 4830 head, and the average value is given at £12 a head. This number, however, includes an average of 1733 exported to the Channel Islands for food, so that the number of breeding animals is 3097 and the average value probably about £60. The United States, America on the one hand, and the republics of Argentina and Uruguay on the other, are by far the largest purchasers. In the period mentioned the former country took 32 per cent., and the latter two 30 per cent. of the total head exported. Canada and British South Africa are the next largest purchasing countries, having taken about 7 per cent. each, while Australia and New Zealand together accounted for about 4 per cent. of the total. Although no figures are available, it is well known that Shorthorn is the breed which is by much the most numerous represented in the exports, and is that which is most cosmopolitan in its distribution. Herefords are exported in considerable numbers to South America and have, in the past, been taken in large numbers to the United States. Aberdeen Angus, Red Poll, Jersey, Guernsey, Ayrshire, Devon, Sussex and Galloway all play a greater or less part in the export trade, and there is probably no breed which is not occasionally represented.

The export trade has had a very marked tendency to raise the prices of the types of stock taken. The effect of foreign competition may be shown by comparing the prices brought by Shorthorns and Aberdeen Angus, the former of which breeds enjoys a large export trade at present while the latter is comparatively neglected. At the two largest Shorthorn sales (Perth and Birmingham) some 1100 bulls were sold in the years 1910 and 1913, at the average price of £53. At the corresponding sales of Aberdeen-Angus, about 750 bulls brought an average price of £33.

A somewhat striking feature of the British Cattle Industry, if compared with that of other countries, is the extent to which particular districts have specialized in particular branches, for which the special conditions render them suitable. Thus there are districts in which dairying is the only important branch, and others in which rearing or fattening respectively predominate. The result of this is a very large trade both in young store animals and in others ready for fattening, the ex-

which may to some extent be judged from the fact that Great Britain imports from Ireland about half a million stores annually.

As regards systems of management, various methods of rearing are employed. In some regions, as for example the Western Highlands of Scotland, calves are brought up in the natural manner, on their own dams. It is needless to say this method can be employed for ordinary commercial purposes only on the cheapest class of land, where the cost of maintaining a cow for the year is low. In some cultivated districts a method of rearing is employed whereby the calves are suckled, but where each cow is made to rear two or more calves in the course of her lactation period. Extra calves, or in some cases two, are bought for each cow when she comes into milk and are put on along with the cow's own calf. Later, usually after about 4 months, these are weaned, and one or two others are put on. In this manner many farmers are able to rear an average of three, and in some cases of four, calves on each of their cows. A fairly large and fairly deep milking stock of cows, as well as careful supervision, are necessary to make this system a success. The commonest method of rearing is however that by which the calves are pail fed, receiving milk only during the first few weeks, and being then gradually transferred to skimmed or separated milk with a cream substitute. Various substances are employed in the latter capacity, but crushed linseed or crushed oats or oatmeal are perhaps the most widely used. There are many proprietary cream substitutes on the market.

There is not much to be said regarding the methods of rearing, from the time of weaning until the animal is ready to be fattened. In summer growing cattle are kept at pasture, and rarely receive any additional feeding. In winter they may be kept indoors, generally in covered or partially covered yards, or they may be left outside for the most part, depending on the climate of the district. The winter food consists of roots, hay and straw, with a small quantity of artificial food, often linseed cake in the case of very young animals, generally cotton cake for older ones. The proportions of these materials used to build up the ration vary considerably in different districts. In arable districts, and especially in the north, roots preponderate, while in grazing districts hay constitutes the greater part of the ration, or sometimes, as in Ireland, practically the whole.

Fattening is, in summer, carried out for the most part on the grazing system, although sometimes the animals are kept in yards and fed with cut grass, vetches, etc. Some pastures are capable of fattening cattle without any additional ration, but generally speaking some 4 to 8 lbs. of feeding cake are given, at least during the finishing stages. Winter fattening rations show the same variation as do those for young cattle. In the north-east of Scotland, a typical ration would consist of 100 or 120 lbs. of turnips or swedes, 10-14 lbs. of oat straw and 4-8 lbs. of concentrates. In the eastern districts of England about half the above quantity of roots is employed, with part at least of the fodder in the form of hay, and generally a larger quantity of concentrate. In south-western England and in Ireland, the main part of the ration is hay, with a moderate al-

lowance of cake, and sometimes a small allowance of roots. Fattening cattle are perhaps most frequently kept in lots of 6 to 20 in covered or partially covered yards, but many are also fed in single or double boxes, tied up in byres. The process of fattening generally lasts from 3 to 6 months and finished cattle come on the market at anything between 15 months and 3 ½ years of age.

Systems of dairy management are many and varied. In cheese-making districts it is generally arranged for the cows to calve in spring, as it is not considered economical to produce any large quantity of cheese during the winter months. The cattle run at pasture in summer, and may receive perhaps 2 or 4 lbs. of concentrate, such as bean meal or cotton cake. In winter they are fed on a rather low ration consisting largely of hay with perhaps 20 or 30 lbs. of roots and again a little cake or meal. In other districts, where butter or whole milk is sold, the cows are arranged to calve at more or less regular intervals throughout the year, and they are also much more intensively fed throughout the winter.

In the neighbourhood of many large towns, dairy men are frequently not breeders of cattle, and in many cases not even farmers. They purchase freshly calved cows, milk them for a period of ten or twelve months fattening them in the interval, and sell them for slaughter at the end of this period. The ration consists of cut grass, vetches, etc., in summer, and of roots, hay and straw in winter, with an allowance of 10-15 lbs. of cake, meal or part equivalent of wet brewers' or distillers' grains in either case.

As regards the value of commercial stock, the average price of first quality Shorthorn cows, in milk, is given in the Agricultural Returns at £21 10s. for the last five years; and good specimens frequently bring £25, and occasionally over £30. The average price brought for all classes of cows in milk is probably between £17 and £18. Young calves of dairy breeds bring from 10s to 30s, and those of the larger beef and dual purpose breeds from 30s to £3. Two year old store cattle of the Shorthorn, Angus and Hereford breeds are quoted in the official returns at from £12 to £17, and £14 is probably about an average. The mean price of fat cattle for the past five years is given at 35s 2d per live cwt. (112 lbs.), making the probable average price per head about £18.

At the present time, one of the main features of the cattle industry in Britain is the scarcity of stores, or at least the insufficiency of the supply of this class of cattle to meet the demands of feeders. The consequence of this is the high price at present ruling for stores, and the diminution in the profits of feeding. This points to the probability of a further, and possibly more rapid, increase in the national herd in the future.

There is also abundant evidence that more attention is being devoted to the improvement of dairy stock than has been, in the past, directed to this end. This tendency is shown in the very rapid development of milk record societies, as already mentioned, and also in the greatly increased prices that are now being paid for pedigree dairy stock, compared to those ruling a few years ago. The increasing importance of the dairy industry probably to a considerable extent accounts for this tendency.

Experience and Progress in Moor-Cultivation in Germany

by

Geh. Regierungsrat Prof. TACKE, of Bremen.

Investigation of the natural history of moors in general, and of the basis of their agricultural utilization in particular, is arousing ever widening circles. The work of the Institutes specially for moor investigations (Moor-Versuchs-Anstalten), of the Geologists of the country and of numerous individual investigators is successfully directed to the extension of our knowledge of the origin, and alterations of the various types of moors from the geological and chemical standpoints. Remarkable efforts have also been made with the object of obtaining uniform definitions of the terms in the study of moors, and a classification of the various peat and soil conditions, which however, have not yet led to conclusive results. Of importance from a practical point of view is the not yet fully solved question as to the existence of so-called humic acids, especially in the form of peat. While on the one hand attempts are made to prove that the phenomena attributed to reactions or free humic acids, consequently excesses, are nothing else than purely colloidal or physical effects, on the other hand the view is held on the strength of extensive researches that the undeniably colloidal state of humic substances in any means exclude the existence of real humic acids and of reactions caused by them.

Recent researches upon the bacteriological conditions in untouched and cultivated moors allowed striking differences in the kind and number of lower organisms to be recognised, as well as the great effect on them by the various operations of cultivation. Both bacteriological and chemical investigations proved that the very energetic action of nitrogen compounds which under some circumstances in moor soils, to the detriment of the yield, can be of a purely chemical nature. Closely connected with this question is that of the effect of heavy liming on sour moor soils and those poor in nitrogen. In spite of much research has not yet found a satisfactory ex-

planation of the importance is the result, that the quantity of lime required for very acid moor soils lacking in lime, especially for peatlands and hoed crops are grown, must be kept within narrow limits, not more than 16 cwt. per acre, calculated as calcium oxide. On the other hand the same land is put to permanent meadow or pasture, at least a heavy lime should be spread; under certain conditions, especially in the case of mowing, still more is to be given to ensure success. No inference can be drawn here. The explanation of this phenomenon, which at first seems striking, is that the permanent flora of every good meadow

and pasture contains a sufficiently large proportion of clover, and it is favoured to such an extent by an abundance of lime that the unfavourable effect of much lime on the other grasses is not only made good but even outbalanced. According to recent experience, much stress is laid on the minute division of the substance used in liming moor and similar soil requiring lime.

Comparative experiments with various potash salts on moors, especially when strong doses are used and on permanent meadows and pastures, seem to show that the concentrated salts are more advantageous than the crude salts.

Crude phosphates, and also such as are of amorphous outer texture (soft earthy phosphates), are recognised unanimously as suitable only for those moor soils which remain very acid even under cultivation.

Among the new nitrogenous manures, the several kinds of nitrates obtained from atmospheric nitrogen have in general proved as advantageous on moor soils as the nitrogenous manures hitherto successfully employed (nitrate of soda and sulphate of ammonia). Nitrate of lime containing nitrates has proved less successful. Cyanamide, when used early enough before sowing, has a greater or less effect on nitrogen-hungry moors according to the state of cultivation of the soil; but the effect is generally less than half that of the nitrogen in nitrate of soda.

In the practice of moor-cultivation the most important processes and progress are the following:

The improvement of fens rich in lime and nitrogen by the use of Kipau's system of sand covering for arable land has quite gone out of fashion. The chief reasons against it are: the high technical development of meadow and pasture farming on moors of all kinds not treated with sand, the continued favourable economic situation for the disposal of animal products, the scarcity of agricultural labourers and the relatively high amount of labour for sanded arable cultivation (while meadows and pastures require so much less), and lastly the circumstance that the natural economic and personal conditions necessary for the successful execution of the intensive form of farming constituted by sanded moor cultivation are not frequently found.

The development of meadows and pastures on moors of all kinds which is especially great on the true moors (Hochmoor) which have been less richly endowed by nature with plant food, depends mainly upon the following progress:

- 1) The recognition that, where water conditions are suitable, permanent grassland can be made to give heavy yields without recourse to the expensive use of sand as covering (fens) or for mixing with the surface (moors).

- 2) The improved methods of tillage, which induce a better physical condition of the soil, especially for new crops, by the use of more suitable implements (ploughs, harrows and disk harrows worked by animal or mechanical power). Among these, some rollers especially constructed for the work are very important; they compress the soil after it has been

oken down to a good tilth, thus improving its capillarity to the benefit the forage plants and affording a firmer footing to the stock at pasture. The regular use of heavy rollers has greatly contributed to the present development of pasturing on unsanded moor soil.

3) The extensive use of subsoil drainage in various forms (sod drains, laths, fascine, pole and tile drains with supports of laths, heather and the like under them to prevent sagging).

4) The exhaustive study of grasses on moor soils and of the life history of the most important meadow and pasture plants, which has led to the production of clover and grass mixtures suitable to the most various districts and localities.

The yields of properly laid down moor meadows and pastures are so satisfactory in all respects that they are equal to those of the best natural meadows (1). By means of instruction on the part of the moor experiment institutions and commissions appointed for the purpose, of numerous model cultivations in which the association for the promotion of moor-cultivation in the German Empire has taken an active part, and of some large moor-cultivation enterprises of this kind on moors and fens (e.g. at Friesian domain moors, Royal Schmolsin Estate), the knowledge of the methods and of the success obtained has spread everywhere and satisfactory development of moor cultivation is taking place on all moors, especially in the old existing moor centres of north-west Germany.

Owing largely to the interest repeatedly shown by the German Empire in the transactions on the promotion of moor-cultivation and on home colonisation in the Prussian Economic Council and in the German Council of Agriculture, interest has been satisfactorily awakened in all circles, especially in administrative and parliamentary ones, on the utilisation of the still existing large areas of moorland, especially as a field for colonisation. One effect of this is evidently the recent appropriation of greater sums for moor cultivation and moor colonisation, through which some of the moors are to be taken in hand and existing colonisation associations are to be assisted. Further, the Prussian agricultural administration has begun to institute special organisations for the object of utilising and cultivating moors (offices for moor and wasteland cultivation in the provinces including much moor), as well as to provide the necessary competent staff of officials by instituting courses on the cultivation of moors in the several institutions (Moor Experiment Station at Bremen, Moor Experiment Farm of the Pomeranian Chamber of Agriculture at Neu-Ulmersstein in the Leba moor, Stolp district, Pomerania). The State of the Provinces have already set aside considerable sums, especially in the case of cooperative moor improvements.

(1) *Die Versorgung Deutschlands mit Fleisch und die Kultivierung unserer Moore und Wälder*, Memoir of the Association for the promotion of moor-cultivation in the German Empire, — *Denkschrift des Ministeriums für Landwirtschaft, Domänen und Forsten über die Moorkultur und Moorbeseidung in Preussen*, 1912. — *Mitteilungen über die Arbeit der Moor-Versuchs-Station in Bremen*, Report 5, 1913.

A law for the protection of moors, at present for the province of Hannover, but which it is hoped will be extended to other provinces including moors, is intended to prevent the destruction of valuable moors by the unsuitable extraction of peat.

Of special importance is the profit that the colonisation of the large moor tracts can draw from the progress of moor cultivation. The character of the farms in the new colonies is simple and safe, owing to the success attendant upon meadow and pasture farming on the moors; not only can the colonisation of these waste lands considerably increase the home agricultural output, especially as regards animal produce, but the increase of small and medium-sized farms, such as are especially suitable for moor, represents an increase of the strength of the nation.

Recent Work of the Royal Entomological Station of Hungary

by

J. JABLONOWSKY,

Director of the Station.

I shall describe below the means of control employed by the Station in the course of 1913 against some parasites.

The corn ground beetle (*Zabrus tenebrioides* Goeze, *Z. gibbus* Fb.) is in Hungary one of the most injurious insects. Its larvae injure the crops in autumn, attacking the cereal seedlings, and if the winter is mild they continue their ravages up to the beginning of May. In the month of June the insects devour during the night the grains of barley that are still in the milk stage. What steps can be taken to destroy this pest? For the most part the farmers excavate ditches in autumn or in spring round the infested field and this operation satisfies them, though the parasite is not destroyed by it. It has been known for a long time that in our country this insect becomes so injurious not only on account of the succession of the same cereals on the same soil, but also because in innumerable localities in Hungary wheat follows barley or is sown near the stubble of barley. The former practice may be avoided, but the second is often inevitable. Thus it becomes impossible to obtain by the above process any notable result.

In consequence of the experiments made in the autumn of 1912 in the neighbourhood of Nagykáta (at Szentmártonkáta, county of Pest), the Entomological Station has found an effective means of control of the corn ground beetle. A large estate of the neighbourhood, on passing into the hands of a new owner, fell into a deplorable condition in consequence of a change in the system of cultivation. The cereals sown in autumn, on an area of 14 acres, showed before the beginning of winter the "spots" due to the beetle. The spraying of sulphate of nicotine with which we had experimentally

same year (1912) for the destruction of other pests soon produced an unexpectedly successful result: the "spots" that were treated did not spread in following spring, because the larvae living on the ground had perished. employed about 2 oz. of sulphate of nicotine and 1 ½ lb. of soft soap dissolved in 10 gallons of water. The spraying is performed with a common backpack sprayer, and besides the "spots" the healthy plants for about an inch all round them are also treated. The earlier the spraying is done, the more effective is its action and the lower its cost.

The cereal or barley leaf beetle (*Lema melanopus*) is also included among numerous insect pests of Hungary, but it does not cause injury to barley or oats except sporadically. The insect appears when these cereals, sown in the spring, are still tender, and it attacks their leaves. Nevertheless the mischief becomes serious only when the larvae hatch out of the eggs laid by the females on the leaves of barley and especially on those of oats; they then invade and devour all the leaves. The plants dry before the proper time and yield no seed, and even the haulms which are cut for straw are rejected by the live stock, because the larvae, like those of other *Criocera*, secrete a viscous substance which moistens the surface of their bodies and with which they soil the haulm.

The means of control known in our country was devised about 18 years ago by one of the officials of the Entomological Station, Prof Sajó. It consisted in collecting the insects which appeared at the beginning of spring by means of a net or in spraying with tobacco extract (since 1892 known in Hungary under the name of Thanaton). Nevertheless these means of defence did not spread in our country, the causes being that in general no one attended much to the adult parasite; at most it was noticed in the later years of its ravages, and consequently no one used the nets. On the other hand the active principle of the juice, was not constant; the first tobacco extract, very active, contained 12 to 13 per cent. of nicotine, whilst later this content fell to 4 per cent. and even less. It is therefore not surprising that this insecticide has lost all credit.

In the course of the year 1913, we resumed the practice of catching the insect by means of nets, and instead of using the usual tobacco extract (Thanaton) we employed sulphate of nicotine. The insects were caught on an estate in the commune of Bokszeg (county of Arad). The result of the operation was satisfactory, inasmuch as on the fields where the net had been used the yield was about the average, while on the other areas it was much lower. It must, however, be mentioned that in 1913 this insect, owing to the rain which fell in May and June, did not commit the havoc it would have done if the weather had been dry and warm.

Spraying produced equally favourable results, though the rains of May and June rendered the work more difficult. The spraying was effected at Csála (near the town of Arad) in one of the State vineyards, using 4 lbs. of nicotine and 15 lbs. of soft soap to 100 gallons of water. A smaller quantity of nicotine was not equally efficient, while on the other hand a quantity greater than 4 lbs. per 100 galls. did not give any better results. The experiment succeeded perfectly, notwithstanding the fact that favourable weather,

that is not rainy, was rather rare. On the spots that were treated the larvae were completely destroyed, whilst where no treatment was applied they continued their depredations and then went through their metamorphosis.

This experiment made with the two systems offers farmers the possibility of controlling the pest in either way without being hindered by unfavourable weather.

Vine Caterpillars. — Similarly, other experiments were conducted on a larger scale with sulphate of nicotine against the caterpillars of *Conchylis ambiguella* and of *Polychrosis botrana*, which in Hungary (especially in the most valuable vineyards on sandy soils) cause as much injury as elsewhere. The experiments were conducted at Kecskemet (county of Pest) in the Miklós nursery (Miklós-Telep National School for Vine growers), and on a large scale in the vineyard of the Royal Hungarian School of Agriculture Jászberény (county of Jász-Nagykun-Szolnok).

As a result of studies continued through a long series of years, the Entomological Station adopted the means of control which had succeeded especially in France, using sprays containing two ounces of nicotine (either sulphate of nicotine or the nicotine of the common extract) and 1 1/2 lb. soft soap to 10 gallons of water, or Dr. Jean Dufour's mixture composed 1 1/2 lb. of pyrethrum powder and 3 lbs. of soft soap to 10 gallons of water. Our system of control was thus similar to that employed elsewhere. In 1913 the appearance of the larvae of *Conchylis* was reported on May 11, began spraying ten days later. Instead of the Eclair Vermorel we used sprayer mounted with an air pump working at a pressure of 4 or 5 atmospheres and provided with a forked rod bearing two nozzles, so that the two powered cone-shaped jets strike the bunches on opposite sides at the same time. During the work we observed that on the vines treated at first there were still some larvae, while the bunches of the vines treated after the 24th and 29th of May were freed from 98 to 99 per cent. of them. The action of the liquid insecticides was very nearly the same, inasmuch as all the bunches treated either with nicotine or with pyrethrum powder were free from insects. Sometimes, however, the sulphate of nicotine proved the more effective. Between May 24 and June 8 the whole vineyard, about 43 acres was treated, and there was still time to treat again the first plots (which had been treated between the 19th and the 24th of May) and which the caterpillars had not wholly abandoned. At the time when the vines were in bloom the vineyard was completely freed from caterpillars, which left scarcely any trace of their ravages.

These experiments have thus demonstrated that spraying gives the result of 98 to 99 per cent., provided the following conditions be observed: 1) that the control by means of liquid insecticides be commenced at the most favourable moment for the hatching of the caterpillars (in Hungary in 1913 it was after May 24); 2) that the spraying be carried out under great pressure; 3) that the bunches be sprayed on both sides; 4) that the solutions be composed of insecticidal substances (nicotine and pyrethrum) and of substances capable of removing fat (soap).

A complete destruction of the caterpillars is impossible, as on account of the continued appearance of the moths of *Polychrosis*, some caterpillars hatch out much later, and further the earlier ones do not attack the leaves of grapes but hide under the bark of the young shoots.

The results obtained by the experiments having been striking, our next will consist in spreading the above method of destruction among vine growers of the country.

Grape moth. — Among the other enemies of the vine we undertook experiments on a large scale against the caterpillars of the grape moth (*trix pilleriana*). These caterpillars cause enormous injury, not only in the old vineyards of the mountainous districts and in those previously neglected (as for instance at Versecz, county of Temes), but also in the vineyards on sandy soils, and the havoc caused reminds us of the times when they most seriously threatened the French vineyards. In our country, in some vineyards, for instance at Sóstóhegy (near the town of Nyiregyháza, county of Zabolcs), where we carried out our largest experiments, the vine stocks having been injured for three years in succession did not bear anything but slender shoots. Our experiments consisted partly in the destruction of the caterpillar at the beginning of spring, that is during the time when the small caterpillar is still in the oldest part of the vine stock, and partly in control practised after burgeoning, when the caterpillar ascends on the young shoots. The treatment before the shoots appeared proved completely inefficient. The two well-known processes of scalding and fumigating with sulphurous vapours were not employed. After the appearance of the shoots we had recourse to the treatment with tobacco juice until the caterpillars were destroyed to the extremity of the shoots, without however obtaining any encouraging results, the solution being unable to reach the caterpillar among the leaves. Instead of this treatment, we picked off the caterpillars by snipping of the young shoots on which the caterpillars were crowded and destroyed many of those scattered on the plants. Nevertheless the result was not complete. Although 150 or 200 caterpillars per vine had been collected, on the ground or on the green hedge soon betook themselves to the vines that had been freed. In order to get rid of these we used a Bordeaux mixture to which half a pound of arsenate of lead had been added to 100 gallons of liquid. We do not yet know what effect this treatment will have. In 1913 the result was not decisive.

Cockchafer. — The means of control used against the cockchafer (*phylla fullo*) in the commune of Csongrád (county of Csongrád) have yielded any decisive results. The larvae of this insect cause such havoc in the vineyards on sandy and very dry soils that not only are numerous old vineyards completely destroyed, but their reconstitution is rendered impossible because the larvae destroy the newly planted stocks. In order to get rid of this pest the commune of Csongrád decided to have the insects destroyed by hand and to pay for them. Unfortunately in 1913 during harvest the insect did not appear. It is not known if the extraordinarily cold winter and continued rain of 1913 was the cause of this, or if the insects are in a dormant state at all this year. Nevertheless, on grubbing in the sand, larvae

large and small were found, but no pupae or adult insects. At Keszthely (county of Pest), situated near Csongrád, both larvae and insects were unearthed and swarming took place. The several thousands of insects that were picked have shown how future control is to be organized. Knowing the preference of this chafer for Scots pine (*Pinus sylvestris*), Corsican pine (*P. Laricio*), Austrian pine (*P. austriaca*) and black spruce (*Picea nigra*) I caused a railway-truckload of large pine branches to be brought from the Szeged pine forests and planted them in the sand of the Csongrád vineyard so that the needles remained fresh for some time. The great majority of the cockchafers were picked from these branches. It is therefore a visible henceforward to plant a greater number of these trees in our vineyards and to collect these insects regularly. This process will be easier and cheaper than picking them off fruit trees and poplars 50 or 60 feet high.

Rodents. — The diffusion of the means of control against rodents is another great undertaking. The Entomological Station, which deals with the destruction of mammals injurious to fields and gardens, aims at rendering the control of voles, hamster rats and susliks (*Spermophilus citellus*) compulsory by law, and proposes: 1) that the operations of control be carried out every spring (from the middle of March to the middle of April), when the numbers of the vermin are not yet large, and agricultural labourers can dispose of the necessary time; 2) that against voles flooding, traps (Hohenheim type) and carbon disulphide (5 grams per bushel) be used; 3) that against susliks, 20 grams be used and against hamsters, 30 grams.

In the spring of 1913 the small commune of Kopesény (county of Moson) began the obligatory control; it was followed by the county of Szepes, 5 communes of the county of Bereg on both banks of the Latorcza, in control of susliks and hamsters. In these localities hamsters had for several years done much mischief in the maize and other grain fields, there being 40 to 60 burrows per acre. At first the small owners were sceptical as to the efficiency of carbon disulphide, but when after the second and third day of the treatment they observed that the hamster and suslik burrows remained closed and that on opening them only dead animals were found diffidence disappeared and they worked with zeal and care. It is very urgent to spread this method of control, especially against hamsters, who are extending and causing much injury in the communes of Sopron county on the Austrian frontier.

Lime-sulphur mixture. — Lastly it must be mentioned that during winter 1912-13 the Entomological Station occupied itself with propaganda for the use of lime-sulphur mixture, which is beginning to be known in Hungary. Notwithstanding the fact that this preparation is very effective against *Lecanium*, its spread in our country cannot be very rapid, because: 1) preparation is lengthy; 2) it does not always succeed on account of the varying nature of the different quicklimes of the country; 3) its preparation is not carried out on a large scale in Hungary nor at a low price. On the contrary the practice of spraying fruit trees in winter with carbolineum (15 lbs. of carbolineum to 10 gallons of water) is constantly gaining ground.

SECOND PART.
ABSTRACTS

AGRICULTURAL INTELLIGENCE

GENERAL INFORMATION.

— The Development of Agriculture in the German Colonies. — WAKBURG, O.
in *Der Tropenpflanzer*, Year 18, No. 1, pp. 1-25, Berlin, January 1914.
The writer points out the increase in the exportation of agricultural
duce from the German colonies during the last two years (1910-1912).

TABLE I. — *German East Africa.*

	Quantity — tons		Value — £	
	1910	1912	1910	1912
l.	7 114	16 810	147 600	360 700
station rubber	406	1 036	161 300	300 950
on	613	1 852	36 800	102 900
ce	980	1 551	41 050	93 250
ra	5 254	4 174	93 500	76 600
andnuts	3 050	5 983	29 200	62 400
me	802	1 852	11 800	25 600
Total	18 219	33 258	521 250	1 022 400

With the exception of copra, all the exports have increased, some even
enormous proportions (cotton 302 per cent.).

TABLE II. — *Kamerun.*

	Quantity — tons		Value — £	
	1910	1912	1910	1912
Plantation rubber	—	24	—	8 400
Elaeis kernels	13 473	15 737	174 100	215 900
Palm oil	3 091	3 538	61 750	81 450
Cacao	3 377	4 479	149 700	207 850
Total	19 941	23 778	385 550	513 600

Plantation rubber makes its appearance. The writer remarks the wild rubber has been badly hit by the present crisis.

TABLE III. — *Togo.*

	Quantity — tons		Value — £	
	1910	1912	1910	1912
Elaeis kernels	8 071	11 455	99 670	165 600
Palm oil	2 971	3 284	60 420	69 250
Cotton	463	542	22 350	25 250
Rubber	133	163	56 200	47 800
Maize	3 340	1 343	14 210	11 130
Copra	134	160	2 000	3 000
Cacao	135	279	4 700	11 900
Total	15 247	17 226	259 550	334 100

Maize is the only crop not showing an increase in exports.

TABLE IV. — *New Guinea.*
(Including the Bismarck Archipelago and the Solomon Isles).

	Quantity — tons		Value — £	
	1910	1912	1910	1912
Copra	9 094	11 193	148 800	198 500
Rubber	6	21	3 300	7 600
Cacao	39	73	2 700	3 700
Sisal	—	21	—	500
Total	9 139	11 308	154 800	210 400

The exports of the above four staples have increased, but only copra real importance.

From the other islands of German Oceania agricultural exports have risen from £ 234 900 to £ 342 000.

On the whole, during the last two years agricultural exports have increased 25 per cent. in weight and 53 per cent in value.

With the progress of agriculture the spontaneous products diminish: di rubber, copal, tannin and ivory. On the other hand, in Kamerun, kola and karité are on the increase, as shown by the following figures:

	Quantity — tons		Value — £	
	1910	1912	1910	1912
nuts	54	234	880	8 180
ité	66	105	250	640

The writer shows what progress has been accomplished by native farming. Out of the 54 000 acres planted to cotton in German East Africa, 500 acres were cultivated by natives. The progress achieved by German cotton is mainly due to two causes: 1) the erection of ginning stations (37 in East Africa and 12 in Togo), principally by the "Kolonialwirtschaftlichen Komitee"; 2) the institution of experiment stations for the study of diseases, methods of farming and varieties.

Among the oil seeds, besides sesame and groundnuts, the cultivation of which is developing, castor oil is grown in coconut plantations if the latter are in bearing, and it seems to give good results.

During the last few years, farming by Europeans has developed to an extraordinary degree. The chief plants grown are oil palms, tobacco and bananas.

The cultivation of oil palm has advanced thanks to the introduction of new methods, which allow four or five tons of fruit per day to be treated by only 16 or 20 hands, and the fat thus obtained is superior to that formerly produced.

At the end of this year there will be about 2 500 acres of bananas in East Africa, and steamers calculated to carry 50 000 bunches will ensure the rapid transport from Tiko to Hamburg.

The most interesting of recently introduced crops in Kamerun is tobacco. The experiments have produced leaves for wrappers worth upwards of 6s 6d per lb. on the Bremen market, and some powerful companies have been formed. It must not, however, be forgotten that Kamerun plants will be in a state of inferiority to those of Sumatra as regards both transport and labour.

196. - **Grants for Agricultural Education and Research in England and Wales in the Year 1912-13.** (1). — *Board of Agriculture and Fisheries, Annual Report on the Distribution of Grants for Agricultural Education and Research in the Year 1912-1913* pp. XXV + 132. London, 1913.

This report on the distribution of grants in aid of agricultural education and research gives first some information on the present organization of agricultural education in England and Wales (2). Then follow lists of the grants awarded to the various institutions, with indication as to the kind of work for which a grant is made, and of the grants awarded for the provision of technical advice for farmers and the investigation of local problems, as well as those for building and for miscellaneous purposes sanctioned by the Treasury from the Development Fund up to 31st March 1913.

The amounts are given below:

Grants in aid of Universities and University Colleges	£ 10 000
" " " " Agricultural Colleges	" 6 050
" " " " Special Institutions	" 2 800
" " " " Farm Schools	" 290
" " " " Agricultural Research Institutes	" 6 434
" " " " agricultural research and experiments	" 3 008
" for the provision of technical advice for farmers and the investigation of local problems	" 1 568
Total	£ 30 150

Grants for buildings and for miscellaneous purposes from the Development Fund amount to £62 495.

The report contains also information on certain institutions in receipt of grants, notes on work at research institutes, research scholarships in agricultural science in the years 1911-12, the staffs of Universities and Agricultural Colleges in receipt of grants and the number of students (altogether 1165) attending course at Universities and University and Agricultural Colleges in receipt of grants, besides communications upon the organization of local schemes of agricultural education and advisory councils.

197. - **Agricultural Shows.**

Australia.

1914. May 6 (opens). Hobart. — Inter-state fruit exhibition.

Aug. 11-16 Brisbane. — National exhibition.

Austria.

1914. May 16-21 Prague. — Annual Bohemian Agricultural Exhibition.

Sept. 7-12. Görlitz. — Vine-growing and wine-making show, held on the occasion of the 9th Austrian Oenological Congress.

Dutch East Indies.

1914. Sept. 8-Oct 10. Batavia. — International rubber show.

(1) For 1911-12, see No. 452, B. May 1913.

(2) See No. 1018, B. Sept. 1913.

France.

4 April 1-5. Nantes. — Poultry show organized by the "Syndicat des Aviculteurs de l'Ouest".

May. Epemay. — Agricultural, horticultural and vine-growing show, organized by the "Union agricole, horticole et viticole de la Marne".

Oct 24-28. Cette. — Federal horticultural show, organized by the "Federation horticole du Littoral" (Hérault, Gard, Vaucluse, Bouches-du-Rhône).

Germany.

May 15-21. Altona. — Great exhibition of horticulture, fruit and vegetables, organized by the City of Altona in commemoration of the 250 th anniversary of its foundation. Address to the Committee, 75 Flottbecker Chaussee, Altona.

Holland.

4 July. The Hague. — Horse show. Sec. A. v. Hoboken, Nieuwe School-sstraat 27, The Hague.

Hungary.

4 April 4-6. Budapest, Tattersall. — Thirtieth sale of breeding stock and show of agricultural machines and implements, organized by the National Agricultural Society of Hungary.

Russia.

1 Governments of Kiev and Taurida. — Competition for agricultural machines. Reduced rates on Russian railways and free entry for machines taking part.

Spain.

1 Autumn. Madrid. — International exhibition of agriculture and hygiene.

United Kingdom.

1 May 19-21. London, Chelsea. — Royal Horticultural Society's spring show, at the Royal Hospital Gardens.

May 28-30 and June 1-2. Swansea. — Bath and West and Southern Counties Society's show. Sec. Thos. Plowman, 3 Pierrepont St., Bath.

June 10-13. Portsmouth, Southsea Common. — Royal Counties Agricultural Society's show. Sec. Franklin Simmons, Basingstoke.

June 30. - July 2. London, Kensington. — Royal Horticultural Society's summer show.

- Agricultural Congresses.

Dutch East Indies.

1 Sept 7-12. Batavia. — International rubber congress.

France.

1 July 20-22. Lyons. — International Vine-growing Congress, arranged by the vine-growers' society of the Lyons district in conjunction with the Permanent International Commission on Vine growing. The chief question will be vine mildew (*Plasmopara*).

CROPS AND CULTIVATION.

- **Distribution of Drought.** — Communication from Professor FILIPPO EREDIA, of the Central Bureau of Meteorology and Geodynamics, Rome.

In Russia Professor Broounoff has been the means of starting studies the effect of meteorological factors on the crops. The interesting results which he has obtained are such as to favour the general adoption of the Russian methods, especially in countries such as Italy where meteorological researches for the benefit of agriculture have been little followed.

As these methods are based on the climatic individuality of a particular region, their application necessitates a very thorough understanding of the climatic conditions, and quite possibly the methods may require alteration in certain details to make them of more value.

There exists for each plant what is known as the critical period, during which certain meteorological conditions are required. Plants should be adapted in such a way that they have their growing periods at a time when meteorological conditions are favourable. A knowledge of the distribution of rainfall during short periods, of, say, ten days, considerably facilitates the choice of plants suitable for any given climate but is not sufficient, since one cannot deduct from average data as conclusions as to the irregularities of the rainfall. Prof. Broounoff thinks that charts representing the distribution of drought would be useful in this respect, and he suggests for this purpose the term "dry ten-day periods", by which he understands periods of ten days during which the total rainfall does not exceed 5 mm. (0.2 in.)

Charts of this kind already exist in Russia, based on rainfall data accumulated during at least 16 years and determinations of the frequency of drought of a certain ten-day period during a given number of years. By means of these values, reduced to one hundred years, Prof. Broounoff has arranged his charts so as to show the probability of the occurrence of drought. It is evident that these will be of the highest value in the part of the year when rainfall is least; but it is probable that what constitutes a dry ten-day period may need modification, since in certain regions where rain is absent during several months, the idea of drought would not appear to correspond to that which has guided Prof. Broounoff. This is the case in various parts of Italy, particularly in Sicily, where there are distinct rainy and dry seasons, though the rainy season often contains periods of drought or low rainfall. There is no doubt as to the value of knowing the minimum rainfall which will probably take place during a given ten-day period in any given locality, but I believe that more useful inferences could be drawn if the idea of a dry ten-day period could be replaced by notation showing more clearly the occurrence of rain.

An examination of the ten-day periods with a total rainfall of 5 mm. (0.2 in.) shows that different values must be attached to them, according to the time of the year at which they occur; that is to say, during periods of regular rainfall a ten-day period with a total of 5 mm. is really a dry period comparable to one having no influence on vegetation, whilst, on the other hand, if it occurred in a period of extreme dryness, e.g. during the summer months in Sicily, such a period could exercise considerable influence. It would appear, therefore, that the rainfall measurements would be most profitable if the probability of the period with low rainfall greater than 5 mm. were known, and also those of absolute drought. In the various observatories in Sicily, observations of the rainfall have been made during a considerable period, and it may be seen to what extent the ideas expressed above are of value for these regions.

		Frequency of ten-day periods without rain											
		Oct. 1st to 10th											
		Tripoli	Medina	Bhopoto	Catania	Siracusa	Milano	Bortolo	Giarratana	Calabro- setta	Orgeri	Tripoli	Orgeri
		Palermo	Medina	Bhopoto	Catania	Siracusa	Milano	Bortolo	Giarratana	Calabro- setta	Orgeri	Palermo	Orgeri
September	1st	17	25	27	25	37	16	13	4	19	21	63	30
	2nd	23	32	30	12	13	16	23	12	23	17	30	22
	3rd	20	16	20	6	23	25	8	23	31	21	10	9
October	1st	23	19	13	31	19	25	16	17	18	28	10	3
	2nd	10	12	17	12	26	28	12	10	7	7	3	0
	3rd	13	12	3	34	26	22	20	14	11	14	7	3
November	1st	10	12	10	9	13	22	16	10	3	14	7	3
	2nd	23	9	7	12	10	22	16	23	7	7	3	0
	3rd	13	0	10	16	10	19	12	10	11	10	3	0
December	1st	13	6	3	16	16	9	8	7	22	4	0	0
	2nd	10	0	0	6	19	16	8	10	3	19	3	0
	3rd	7	12	0	31	26	19	8	10	3	19	3	0
January	1st	10	6	11	16	19	16	20	16	10	15	0	0
	2nd	13	3	4	16	13	12	14	13	17	22	3	3
	3rd	10	19	7	19	10	19	16	10	7	12	7	3
February	1st	10	3	4	12	23	16	24	23	4	11	10	6
	2nd	27	6	0	9	16	19	12	10	21	18	3	3
	3rd	27	16	14	22	29	25	16	20	11	25	17	10
March	1st	23	3	3	9	42	28	20	30	17	13	7	6
	2nd	9	20	12	36	25	20	23	17	21	13	13	10
	3rd	23	12	7	16	26	34	24	23	0	31	7	3
April	1st	33	25	23	31	29	31	16	20	14	31	7	6
	2nd	20	19	17	19	34	44	32	27	10	29	13	0
	3rd	37	19	23	16	23	34	28	30	7	32	10	0
May	1st	23	34	27	28	39	44	44	38	26	34	17	6
	2nd	47	31	27	22	23	25	20	17	22	21	27	19
	3rd	30	19	10	16	19	16	24	14	11	33	27	20

The first part of the table given here contains numbers expressing the frequency during the period of observation of ten-day periods with not more than 5 mm. rainfall, reduced to a percentage number of years. Since the rainy season lasts from September to April and sometimes to May, we omit the indications relative to June, July and August.

In the first ten-days of January, the frequency of rainfall from 0.1 to 5 mm. is higher for the east and south slopes, the Tyrrhenian slope and the centre showing only one half the figure. In the second ten-days the frequency is higher in the centre and the south slope and still continues high on the east side, while it is less on the Tyrrhenian side. The extreme west presents a higher frequency and is distinct from the conditions shown for the Tyrrhenian slope. In the third ten-days, the differences above indicated are much less, only very small local peculiarities being noticeable. During the three ten-day periods of February, the Tyrrhenian slope shows a minimum frequency in comparison with that of the other slopes, and the extreme west gradually approaches the conditions peculiar to the eastern slope, where on the contrary we meet with a higher frequency. The same conditions hold good in March, when, however, the centre and the lower part of the east slope show a higher frequency; the interior and the extreme west come near in this respect, then the eastern and Tyrrhenian slopes. In April and May the frequencies are little different, except for the lesser frequency in the interior of the Syracuse region and on the upper eastern slope.

In September the frequency is greater for the Tyrrhenian slope and the middle and upper eastern slope, while elsewhere, especially in the interior of the Syracuse region, the frequency is less. In October the frequency becomes higher on the east and south slopes, and diminishes on the Tyrrhenian slope, in the Messina district and in the interior. This difference becomes less in November and December.

We have then various peculiarities appearing. The eastern slope has the greatest frequency of ten-day periods with a rainfall from 0.1 to 5 mm in its central part, except in November, when on the contrary the greatest frequency occurs in the lower part, whereas in the upper part the frequency is reduced in March. The Tyrrhenian slope, which may be said to include Messina, has in September a frequency approaching or slightly exceeding that of the eastern slope, while from October to March it remains lower. The central regions show conditions similar to those of the eastern slope in September; then they acquire the characteristics of the Tyrrhenian slope, losing them again in January. Finally, the southern slope follows the eastern slope from September to February and in March follows the Tyrrhenian slope.

In my opinion droughts in Sicily are best defined by the ten-day periods with complete absence of rain, and I believe that the frequency of these gives a better conception of the idea of drought expressed by M. Brounoff, especially as during the months of the rainy season a ten-day period with 5 mm. or less rainfall may be of some use to the crop since the soil is already damp, whilst in the season of least rainfall so

ntities disappear without being of any use to the crops. Consequently, it did be of use to know the number of dry ten-day periods likely to occur, specially during the rainy season. For this reason the number of times each day period has been dry has been given in the second part of the accompanying table, calculated on a hundred years. The first glance is sufficient to show the radical difference which manifests itself between the different slopes. From the first ten-days of October to the first of January, Tyrrhenian slope appears very different from the eastern, for absence of rain has not been recorded or has been so rare that in the reduction to percentages it has been found impossible to express it by a value approaching unity. In the two other ten-day periods of January there is a slight correspondence, but the frequency on the east slope is greater and persists. The coastal regions and those of the eastern slope follow the conditions of the Tyrrhenian slope in December, but gradually this difference approaches the conditions presented by the eastern slope.

It follows from what has been said that the character of the rainfall is better seen when to the figures for each ten-day period are added those giving the frequency of total rainfall between 0.1 and 5 mm. and of no rain at all.

It would certainly be useful to know the frequency of ten-day periods with a rainfall of from 5 to 10 mm. and also from 10 to 15 mm., since it is the minimum which decides the success or otherwise of the crop.

A conclusion which deserves consideration is that the farmers should know not only the mean quantity of rain, but also the frequency of the different quantities of rainfall for each ten-day period, if they are to derive from it the facts of fundamental value, since the quantity indicated each month has, by itself, only a limited importance.

- **On Seasons and Crops in the East of England.** — SAW, W. N. (Meteorological Office, London) in *Journal of the Scottish Meteorological Society*, Vol. XVI, No. 30, pp. 179-183. Edinburgh, 1923.

A diagrammatic analysis of Mr. R. H. Hooker's paper "Correlation of Weather and Crops"; which appeared in the *Journal of the Royal Statistical Society* (Vol. LXX, pp. 1-51) in 1907. The diagrams present in a graphic form the extent of the correlation between the abnormalities of the present and the abnormalities of rainfall and temperature, not only during the year in which the crop was actually grown but also during the preceding year.

The following conclusions are drawn as a result of the investigation: *wheat*, *barley*, *oats* and *beans* all give the highest returns when the spring and early summer are moist and cool following on a warm midwinter, but while *oats* are unaffected by the character of the previous season, *wheat*, and to a less degree *barley*, are favoured by warmth and dryness in the preceding year, while autumn being specially important for *wheat*. *Beans* are less influenced by the temperature, but require a low rainfall in the summer and autumn of the previous year. *Peas* appear not to be dependent on abnormalities in the season.

Potatoes are exceptional in being favoured by cold and wet in the previous summer and autumn, and do best in a fine, warm growing season,

while *swedes* are favoured by a continuous abnormally low temperature lasting from the previous summer to the end of the growing season, and by rain in the early summer; *mangolds* require plenty of rain and cool weather in the early spring of the crop year.

Lastly, *hay* shows a striking preference for cool, wet weather in the harvest year, with a period of heavy rainfall in the middle of spring.

201 - **Correlation between Meteorological Conditions and Crops in the East of Scotland.** — WATT, A. in *Journal of the Scottish Meteorological Society*, Vol. XI, No. 30, pp. 184-187. Edinburgh, 1913.

This article gives the coefficients of correlation between the year yields of potatoes and oats in Forfarshire (from the official statistics) and the monthly rainfall and temperature for the 26 years from 1886 to 1911. For oats, the coefficients of correlation between yield and rainfall are not significant, while a cool summer is distinctly favourable to the crop. The figures indicate that the largest yields of potatoes are obtained in hot, dry summers, low rainfall being particularly important.

202 - **The Composition of Rainwater Collected in the Hebrides and in Iceland.** — MILLER, N. H. J. (Rothamsted Experiment Station) in *Journal of the Scottish Meteorological Society*, Vol. XVI, No. 30, pp. 141-158. Edinburgh, 1913.

A historical sketch of observations on the composition and properties of rainwater and dew from early times, and an account of recent investigations on the nitrogen and chlorine content of rainwater collected at one point in Iceland, at one point in the West of Scotland, and at three points in the Hebrides lying to the north-west of Scotland — points remote from towns and having a very moist climate.

The amounts of ammonia, nitrate, and chlorine annually brought down by the rain are given below, together with analogous figures taken from the Rothamsted records.

	Rainfall inches	Lbs. per acre			Chlorine
		Nitrogen			
		As ammonia	As nitrate	Total	
Rothamsted	28.8	2.774	1.251	4.025	15.7
Vífilsstadir (Iceland)	38.3	0.802	0.263	1.065	52.2
Laudale (W. of Scotland)	76.9	2.784	1.260	4.044	168.1
Butt of Lewis (Hebrides)	40.6	0.361	0.305	0.666	6.884
Monach "	47.2	1.260	0.588	1.848	2.723
Barrahead "	33.9	1.164	1.104	2.268	5.733

203 - **Rainfall as a Determinant of Soil Moisture.** — SHREVE, F. (The Desert Laboratory, Tucson, Arizona) in *The Plant World*, Vol. XVII, No. 1, pp. 9-26. Baltimore, Md., January 1914.

The influence of rainfall upon the distribution and seasonal activity of plants is obviously exerted chiefly through its power to replenish the soil.

isture of the soil. The desert regions of North America are characterised a low rainfall which is chiefly made up of a large number of light rains a small number of torrential rains accompanied by a heavy run-off. is in investigating the relation of rainfall to soil moisture in desert ions, it is necessary to determine the minimum amount of precipitation nired to influence the soil moisture, and also to determine the durations xriods without significant rain in connection with the development of etation.

The present paper presents a digest of a short record of desert rain- from Tucson, Arizona, interpreted in terms of its possible effect upon soil isture; gives data showing the annual march of water content at three dths (3, 15 and 30 cm.) in a retentive clay soil; indicates the relative ency which different falls of rain were found to have in renewing the e of soil water; and estimates the relative efficiencies of various centages of soil water for the maintenance of plant activity by correlat- them with the current rates of aerial evaporation.

The average annual rainfall at the Desert Laboratory is 14.60 in., dis- mitted in two rainy seasons of which the summer one lasting 63 days ac- nts for 54 per cent. of the annual precipitation. The average number rainy days is 61.5 per annum, on 46.2 of which the rainfall is less than 5 in. In six years there were 32 days with more than 0.75 in. of rain, they yielded 46 per cent. of the total rainfall in the six years. Finally, re have been periods of 140 days without rainfall of sufficient amount 5 in.) to affect the soil moisture.

The march of soil moisture during the year is closely related to the onts of the significant falls of rain, the changes of moisture content being ransitive at the lower depths (15 cm. and 30 cm.) in the heavy clay investigated. The moisture at 3 cm. falls as low as 1 per cent., and t at 30 cm. rises to as much as 32 per cent. The average moisture of soil from the surface to 30 cm. in the driest weeks of the year is 6.5 cent., while in the wettest it is 29 per cent. At its minimum water tent, the clay soil contains about one fourteenth of the annual supply water furnished by the normal rainfall.

The weekly rate of atmospheric evaporation ranges from a minimum 73 cc. to a maximum of 1084 cc. (the annual total being 31 447 cc.) rms of loss from a porous cup atmometer. This is equivalent to a loss 45 cc. per square centimetre from a free water surface. The ratio of poration to rainfall is as 9.3 to 1.

The ratio of evaporation to soil moisture fluctuates from a minimum maximum which are in the proportion of 1 to 10. At the foot of the ta Catalina Mountains (3000 ft.), it is 9.7 times as large as at their sum- (8000 ft.). The annual amplitude of moisture conditions at the Desert oratory is as great, therefore, as that which exists in the most arid , or- of the year between localities which are 5000 vertical feet apart.

204 - **Selective Adsorption by Soils.** — PARKER, E. G. (Bureau of Soils) in *Journal of Agricultural Research*, Vol. I, No. 3, pp. 179-188, Washington, D. C., December 10, 1912.

All phenomena connected with absorption are of the first importance in soil chemistry; of these phenomena, while simple absorptive processes have been the subject of a considerable amount of research, such is not the case with adsorption phenomena (*i. e.* the property which a soil possesses of removing a dissolved substance, such as a salt, permanently from solution), and more especially with selective adsorption (*i. e.* the property of removing a constituent of a dissolved substance, such as the base or cation of a salt, from solution).

As the result of five series of experiments carried out with various soils, the writer reached the following conclusions:

Soils not only have the power of adsorbing dissolved salts from solutions, but also of adsorbing one ion at a greater rate than the other, or adsorbing selectively, to a marked extent.

The presence of bases of the soil (Ca, Mg, etc) in solution after shall or lixiviating a soil with certain salt solutions is probably not due to direct chemical reaction of the salt in solution with the silicates of the soil, but to a reaction of free acid, resulting from a selective adsorption of cation, with the mineral components of the soil.

The rate of adsorption of chlorine ions from solution by soils is slower than that of potassium ions. This selective adsorption of potassium by a soil from a potassium chloride solution increases with the concentration up to a certain point and then remains practically constant. On the other hand the percentage of potassium adsorbed from a potassium chloride solution increases as the concentration of the solution decreases and at very low concentrations is practically complete. In general too, the amount of potassium adsorbed from a solution of potassium chloride increases as the size of the soil particles decreases. In solution of potassium chloride up to a strength of 37.5 gms. per litre, the presence of sodium nitrate decreases the adsorption of potassium; above this concentration it increases adsorption; but the presence of monocalcium phosphate has no appreciable effects on the adsorption.

Finally if a mineral fertilizer be applied to a soil and exposed to rain and thus dissolved and carried through the soil in solution, these substances will be adsorbed either as a whole or selectively from the solution on the vast surface of the soil particles and will be held there by physical forces until the plant removes them. The presence of other mineral substances added to the soil may or may not increase or decrease the rate at which this adsorptive phenomenon takes place.

205 - **Movement of Nitrates in the Soil.** — MALPEAUX, I., and LEFORT, G. (Station d'Agriculture du Pas-de-Calais) in *Annales de la Science Agronomique*, Year 30, pp. 705-726. Paris, December 1913.

In a previous set of experiments (1), the writers showed that the movement of nitrates in the soil, caused by diffusion alone, was very slow, but

(1) See No. 109, B. Feb. 1913.

caught by the evaporation current, nitrates may be brought up deeper strata at a comparatively very rapid rate. Further, they found that it was improbable that nitrate applied and ploughed in as an spring dressing should be washed out of the soil even should the soil prove a wet one.

During 1912 the experiments were continued. A piece of land was ploughed and trenched two spits deep, and divided into six plots which received the following treatment:

- I. Control, received no nitrate.
- II. Received 4 cwt. of sodium nitrate p. acre as a surface dressing.
- III. " " " " buried 5 cm. deep.
- IV. " " " " " 10 " "
- V. " " " " " 1 spit (17 cm.) "
- VI. " " " " " 2 spits (30 cm.) "

The nitrate was applied on April 12th, at which time the soil was in a ploughable condition, containing 14 per cent. of moisture. The plots were further divided right across the series, half of each being left uncropped and on the other half sugar beets were sown on April 18th. Throughout the season, at monthly intervals, the plots were sampled every 10 cm. to a depth of 40 cm., and analysed for nitrates by the Grandval-Lajoux method. A full record was also kept of the rainfall.

I. The Uncropped Soil (Table I). The first sampling, which took place on April 5th showed that the soil in its natural condition contained about 1 gm. of nitrogen as nitrate per 100 dry soil throughout the experimental season; and that the total nitrate content of the dressed plots was greater than that of the control plot by 6.5 to 7 mgm. of nitrogen per 100 dry soil, a figure which represents fairly accurately the calculated value of a dressing of 4 cwt. of sodium nitrate per acre. Between the first and second samplings of April 11th in. of rain fell, and by May 16 there had occurred a rise of nitrate, very noticeable in plots V and VI. The first half of June was very wet, and at the time of the third sampling (June 16th) the zone of maximum nitrate content had been washed from the top 10 cm. to the second 10 cm.; the third 10 cm. was also somewhat richer, but the rain had not washed the nitrates further than this zone as the nitrate content of the fourth 10 cm. had remained practically stationary. A relatively dry period followed, and by July 16th the nitrates had clearly returned to the surface. This again was followed a month later by almost continuous rain during which 4.2 in. fell; yet, in spite of this abnormally wet period, the nitrates on August 16th were still gathered in the second and third 10 cm. layers; the fourth layer too was somewhat richer than before, but it would appear that no nitrates had been washed below this zone, as the totals remained practically the same as at the previous sampling.

The mean distribution of nitrates for the season (*i. e.* the mean of all samplings at each depth and on each plot) shows considerable variation on the different plots. While in I it was almost constant throughout the season, in II, III and IV the surface layer was considerably the richest;

Nitrate as mgm. of N

Date of sampling	Rainfall in inches	Plot I Control, no nitrate						Plot II Nitrate spread on surface						
		Depth of sample in cm.						Depth of sample						
		0-10	10-20	20-30	30-40	Total		0-10	10-20	20-30	30-40	Total		
TABLE I. — <i>Uncropped soil.</i>														
April 15	April 15-30 = 0.2	1.1	1.3	1.0	0.9	0.9	4.0	7.8	1.4	0.9				
	May 1-15 = 0.9													
May 16.	May 15-31 = 0.3	2.8	1.6	1.2	1.1	1.1	5.0	7.3	1.5	1.3				
	June 1-15 = 2.5													
June 16	June 15-30 = 1.0	1.6	0.9	1.9	1.4	1.1	5.3	2.9	4.0	2.3				
	July 1-15 = 0.6													
July 16.	July 15-31 = 2.5	4.2	2.2	0.9	1.2	1.3	5.6	4.0	3.6	2.0				
	Aug. 1-15 = 1.7													
August 16			1.2	1.3	2.3	1.5	6.3	2.0	2.8	1.6				
Totals			7.1	6.3	6.9	5.9	—	24.0	14.3	10.1				
Mean distribution			1.4	1.3	1.4	1.2	—	4.8	2.9	2.0				
TABLE II. — <i>Soil under sugar-beets.</i>														
April 15	April 15-30 = 0.2	1.4	1.2	1.0	0.9	0.9	4.0	7.8	1.4	0.9				
	May 1-31 = 1.2													
June 1	June 1-15 = 2.5	3.5	2.0	1.5	trace	1.0	4.5	6.8	1.7	1.3				
	June 15-30 = 1.0													
July 1	July 1-15 = 0.6	3.1	1.0	1.0	1.4	1.2	4.6	2.4	3.2	2.0				
	July 15-31 = 2.5													
August 1	Aug. 1-15 = 1.7	3.8	1.0	0.8	0.7	1.3	3.8	1.6	1.8	2.8				
	Aug. 15-30 = 2.1													
August 30.			0.9	0.7	0.7	0.9	3.2	1.5	2.5	1.7				

in V the second layer (10-20 cm.), where the nitrate had originally been buried, was richest, and the zone of distribution tended to increase; and in VI the most uniform distribution of all the dressed plots was obtained without, however, any indication of loss of nitrate by washing down below the experimental zone.

II. *Soil under Sugar Beets* (Table II). The first sampling was the same as on the uncropped soil. The second sampling, on June 1st, after a fairly dry month, showed an accumulation of nitrate at the surface except in the case of plot VI, where the upward movement was nevertheless quite evident. At the third sampling the rains had washed the nitrates down to the second layer of 10 cm., and by August 1st the zone of maximum nitrate content was still deeper; but in this latter case the results were not so much due to

100 dry soil.

Plot III Nitrate buried 5 cm. deep.						Plot IV Nitrate buried 10 cm. deep.						Plot V Nitrate buried 17 cm. deep.						Plot VI Nitrate buried 30 cm. deep.					
Depth of sample in cm.						Depth of sample in cm.						Depth of sample in cm.						Depth of sample in cm.					
0-10	10-20	20-30	30-40	Total		0-10	10-20	20-30	30-40	Total		0-10	10-20	20-30	30-40	Total		0-10	10-20	20-30	30-40	Total	
1.9	1.1	0.6	10.6	6.8	2.5	1.0	0.9	11.2	1.6	5.8	2.8	0.7	10.9	1.2	1.8	4.9	2.6	10.5	1.2	1.8	4.9	2.6	10.5
1.8	1.1	1.0	12.1	7.0	2.0	1.5	0.9	11.4	4.0	4.0	2.0	1.3	11.3	3.0	2.1	3.2	2.8	11.1	3.0	2.1	3.2	2.8	11.1
4.5	2.7	1.0	11.0	2.2	5.0	2.1	1.1	10.4	2.0	4.9	3.6	1.4	11.9	2.1	3.5	3.5	2.6	11.7	2.1	3.5	3.5	2.6	11.7
2.9	2.5	2.4	12.8	5.0	2.7	2.1	1.9	11.7	4.8	3.4	2.0	1.6	11.8	4.2	2.9	2.9	2.0	12.0	4.2	2.9	2.9	2.0	12.0
1.6	3.6	2.6	12.3	2.1	3.4	3.8	2.6	11.9	2.8	3.7	3.6	2.6	12.7	2.0	3.4	4.6	2.8	12.8	2.0	3.4	4.6	2.8	12.8
4.4	11.0	7.6	—	23.1	15.6	10.5	7.4	—	15.1	21.8	14.0	7.6	—	12.5	15.7	19.1	12.8	—	12.5	15.7	19.1	12.8	—
2.9	2.2	1.5	—	4.6	3.1	2.1	1.5	—	3.0	4.4	2.8	1.5	—	2.5	2.7	3.8	2.5	—	2.5	2.7	3.8	2.5	—
1.9	1.1	0.6	10.6	6.8	2.5	1.0	0.9	11.2	1.6	5.8	2.8	0.7	10.9	1.2	1.8	4.9	2.6	10.5	1.2	1.8	4.9	2.6	10.5
1.4	1.2	1.1	12.3	5.5	2.8	1.4	1.4	11.1	4.6	3.6	1.7	1.0	10.9	2.8	2.6	3.3	2.6	11.2	2.8	2.6	3.3	2.6	11.2
1.1	2.4	1.4	9.6	2.4	3.4	2.3	1.7	9.8	2.0	3.9	2.4	1.6	9.0	2.4	2.8	3.1	1.2	9.5	2.4	2.8	3.1	1.2	9.5
1.8	2.2	1.7	7.4	1.4	1.7	2.6	1.6	7.3	1.5	1.8	2.4	1.2	7.5	1.4	2.1	2.1	2.0	7.6	1.4	2.1	2.1	2.0	7.6
1.5	1.8	1.5	7.2	1.1	2.0	2.0	1.4	6.5	1.0	1.8	2.4	1.2	6.4	1.0	1.8	1.8	1.8	5.8	1.0	1.8	1.8	1.8	5.8

the washing by rain as to the depletion of the upper layers by the growing crops, the part played by the plant being indicated by the decreasing totals. The last sampling, on August 30th, showed a far more equal distribution of nitrates throughout the experimental zone than was obtained on the unplanted soil, owing to the fact that the influence of the rain is masked by the drying effect of the roots, which are at the same time reducing the nitrate content by absorption just where it would tend to accumulate.

The crop from the time of singling (end of June) onwards reflected distinctly the advantages of burying the nitrate; the differences became somewhat less marked towards the latter end of the season, yet the final results when the roots were lifted at the end of October showed considerable differences in favour of the deeply sown nitrate.

Plot	Yield of sugar-beets p. acre.	
	tons	cwt.
I. Control	14	4
II. (surface dressing)	15	7
III. (5 cm. deep.)	16	8
IV. (10 " ")	17	0
V. (17 " ")	17	18
VI. (30 " ")	22	5

The whole investigation entirely confirms the conclusions previously drawn by the writer as to the necessity of applying nitrate for the beet crop early in the season, and of ploughing it in.

206 - **The Aluminium Reduction Method as Applied to the Determination of Nitrates in "Alkali" Soils.** - BURGESS, P. S. - *University of California Publication in Agricultural Sciences*, Vol. I, No. 4, pp. 51-62. Berkeley, California, May 1913.

The phenoldisulphonic method of determining nitrates in soil does not give satisfactory results where soluble salts are present, as in the case of "alkali" soils, and the following reduction method was tried as a substitute. 100 gms. of soil are mixed with 2 gms. of powdered quicklime and extracted with 200 cc. of distilled water. To 100 cc. of the extract 2 cc. of 50 per cent caustic soda solution is added, and the liquid is reduced to half its bulk by boiling, in order to drive off ammonia. It is then washed into a large test tube fitted with a cork through which passes a bent glass tube drawn out into a point, a strip of aluminium foil is added, and the liquid is maintained at 20-22° C for 11 to 15 hours, after which the ammonia is distilled into $\frac{N}{10}$ acid. The method gave equally satisfactory results whether the soil contained large or small amounts of nitrates, or in the presence of "alkali" salts, neither was it less reliable when soluble organic materials such as soluble humus and dextrose were added to the soil.

207 - **Study of Hungarian Soils by Means of their Water Solutions.** - BAUER-NEBGER in *Földtani Közlemény*, Vol. XLIII, pp. 317-324. Budapest, 1913.

In the course of the autumn of 1912 the agricultural geologists of the Royal Hungarian Geological Institute of Budapest made a collection of the typical soils of Hungary, and the writer analysed the water solutions of 75 samples and determined electrical conductivity, at 18° C., alkalinity, dry residue before and after ignition, loss on ignition, mineral content, and especially the amounts of chlorine, lime and carbon dioxide. Besides, he determined the moisture of each sample.

The results of these analyses have shown that the water solutions may be used to characterise the various types of soils. Thus the grey forest soil contain the least amounts of soluble matter, their alkalinity and lime content are very low, while they are completely lacking in chlorine and carbon dioxide. On the other hand the brown forest soils give in general more concentrated water solutions.

In Hungary the most remarkable steppe soils are the chestnut-coloured and the dark brown ones. These are the most fertile of the Alföld, where they cover vast areas, especially in the angle formed by the rivers Tisza and Dnieper and in the southern part called Báeska. A characteristic feature of these soils is that the soluble substances and the alkalinity generally increase in the upper layers, then diminish to a minimum in the next layer, and increase again towards the subsoil.

In the Alföld there are vast areas of a black clay soil rich in humus, which was formerly the bottom of swamps and which drainage has now rendered cultivable. The distribution of soluble matter in these soils is the reverse of that of the chestnut and dark brown soils, but their content is much greater than that of the corresponding levels of the forest soils. Among these soils, the beginning of that accumulation of salts, which constitutes the salinized soils, is observed.

- Quantitative Mineralogical Analysis of Sandy Soil. — VENDL in *Földtani Közlöny*, Vol. XLIII, pp. 331-343. Budapest, 1913.

In order to determine the composition of a sand or of the sandy component of a soil, the methods hitherto employed were either complete chemical analysis or qualitative mineralogical analysis. The writer has succeeded in combining W. RETGER's method with microscopical and chemical analysis in such a way that he has been able to make a complete mineralogical analysis of the sand of the island of Csepel.

The process begins by separating the various minerals in very heavy fusions and fusions. According to their specific gravity, he separated the following groups of minerals

	Per cent
1) 2.5 to 2.6 Silica, potash-felspar	0.04
2) 2.6 " 2.7 Silica	71.38
3) 2.7 " 3.0 Carbonates, silica, micas	21.73
4) 3.0 " 3.3 Amphiboles	1.39
5) 3.3 " 3.6 Pyroxenes	0.45
6) 3.6 " 4.8 Garnets, rutile, zircon	0.84
7) upwards of 4.8 Magnetite	0.14

With the aid of the microscope the various minerals of each group were determined, and by complete chemical analysis their quantity in each group. Thus the following quantities of the various minerals were found:

	Per cent
Silica	73.70
Potash-feldspar	2.40
Soda- "	3.28
Lime- "	1.85
Carbonates (total)	17.82
Micas	4.00
Apatite	0.04
Amphiboles	1.35
Pyroxenes	0.45
Rutile	0.01
Zircon	0.01
Magnetite	0.14
Garnet	0.70

209 - *Bacillus radicola* and Preparations for Soil Inoculation. — MACKENZIE I. in *Journal Opémoi Agronomii*, Vol. XIV, No. 6, pp. 341-367. St. Petersburg, 1913.

The writer has subjected to bacteriological analysis the preparations for soil inoculation most widely distributed in Russia. At the same time he tested their effect on plant growth by means of pot cultures.

The bacteriological analyses showed that Kühn's liquid nitragin and Bottomley's nitrobacterine did not contain the specific organism, *Bacillus radicola*, while Simon's "azotogen" and Kühn's "solid" nitragin contained about 50 per cent. of the bacillus amongst a mixed population of micro organisms.

In the sand cultures the above preparations were compared with pure cultures of *Bacillus radicola* and with fresh nodules. The best results were obtained with the pure cultures, while the "azotogen" and the nitragin, though less effective, gave satisfactory results. The nodules were least effective of all, but even in this case the plants attained a normal development.

210 - The Toxicity of Soil to Cabbage after a Crop of Sesame. — SKENNER J. in *The Plant World*, Vol. XVI, No. 12, pp. 342-346 + 1 fig. Baltimore, December 1913.

A sample of peat soil from Middle River, California, which had failed to grow cabbages after a crop of sesame, has been investigated by the writer. He found that a clear filtered aqueous extract of the soil had a distinctly injurious effect on water cultures of cabbage plants and to a much less extent on wheat. Treatment of the solution with finely divided carbon black appeared to remove the toxic effects (1).

A heavy oily body, semi-solid when cooled, was separated from the soil by extraction with hot alcohol. This oil is partly soluble in water, forming a solution which is very toxic to the growth of cabbage plants. The results of experiments with this substance are given in the following table:

	Cabbage		Wheat	
	green weight	relative	green weight	relative
Nutrient solution	3.36	100	4.50	100
" " + oily substance.	2.80	83	4.30	96
Distilled water	2.00	100	2.42	100
" " + oily substance.	1.75	88	2.35	97

Plots of the same soil on which no sesame had been grown produce good crops of cabbages. From these results it appears that a crop of sesame secretes substances toxic to cabbages, but not seriously injurious to wheat.

(1) Cf. No. 14, B. Jan. 1914.

Tobacco Stalks as a Fertilizer. — HASKINS, H. D. in *Twenty-fifth Annual Report of the Massachusetts Agricultural Experiment Station*, Part II, pp. 80-84. Boston, 1913. As the tobacco plant is a heavy feeder and is cut before the plant has chance of developing its seed, it is obvious that a large quantity of fertilizing elements must remain in the stalks. Analysis of the latter yielded following results:

Per cent of dry matter.

	Stalks from which the leaves were stripped:	
	I. after curing*	II. in a green condition**
nitrogen	3.25	1.10
potash	4.95	1.00
phosphoric acid	0.78	0.26

Havana Seed Leaf variety. — ** Another variety.

From statistics collected for Havanna Seed Leaf: 8666 plants are usually sown per acre, and the average weight of 10 stalks (stripped) is 6.58 lbs., or 5702 lbs. per acre. Assuming that the stalks contain 52.94 per cent of water, the residue of dry matter produced would be 2684 lbs. per acre, containing the following amount of fertilizing material:

	lbs. per acre
Nitrogen	87.23
Potash	132.85
Phosphoric acid	20.94

Applying the commercial values usually assigned to such material in the form of seed meal or other organic manures, tobacco stalks would be worth about \$24 per acre, or about \$8.40 per ton of partially dried stalks (*i. e.* containing 50 to 53 per cent. of water).

Usually tobacco stalks are thrown out on the land in autumn, left to rot in the rain and snow during the winter, then gathered into heaps and burnt in the spring, the ashes being scattered over the land. Analyses of unexposed and leached stalks showed that only a little over 50 per cent. of the nitrogen was washed out during the winter, probably consisting of the more soluble amide compounds; therefore the spring burning destroys about 40 lbs. of nitrogen per acre, valued at \$7, besides destroying a considerable amount of valuable organic matter. It is recommended that the practice be discontinued, and that the stalks be chopped up and ploughed in.

On the Composition of Giant Kelps. — MERZ, A. R. (Bureau of Soils, U. S. Department of Agriculture) in *The Journal of Industrial and Engineering Chemistry*, Vol. VI, No. 1, pp. 19-20. Easton, Pa., January 1914. The data presented were obtained in the course of investigations directed by Dr. F. K. Cameron, of the Bureau of Soils, during the summer

of 1913, on the possibility of utilizing the beds of gant kelps on the Pacific coast as an economic source of potash salts (1).

The dry material was analysed according to the methods published by Turrentine (*Jour. of Ind. and Eng. Chem.*, IV, 431, 1912) and yield the following results:

Seaweed	Total soluble salts	Potash	Ash	Iodine	Nitrogen
<i>Alaria fistulosa</i> . . .	15.16 to 32.30	2.27 to 13.07	4.41 to 15.08	—	2.05 to 15
<i>Nereocystis</i> sp. . . .	34.38 to 64.44	12.74 to 30.12	2.76 to 10.66	0 to 0.14	0.81 to 1
<i>Macrocystis</i> sp. . . .	19.46 to 45.76	6.92 to 22.48	4.07 to 6.92	0 to 0.30	1.08 to 1
<i>Fucus</i> sp.	17.24 to 17.52	3.48 to 3.51	4.48 to 5.44	—	1.18 to 1
<i>Porphyra</i> sp.	23.54	7.33	4.22	—	5.21

The results indicate that the *Nereocystis* of Alaskan waters is as important as that of more southern seas so far as the potash content is concerned. *Macrocystis* contains a lower percentage of potash than *Nereocystis* and *Alaria* is lower still, while *Fucus* and *Porphyra* are valueless for pot extraction on a commercial scale.

Another series of analyses carried out on *Macrocystis* sp. gathered at La Jolla, California, confirmed previous conclusions that freshly cut seaweed suffers no leaching effects from a short immersion in sea water.

As a certain amount of doubt exists as to the differences in composition between the laminae and stems of the seaweeds (2), the following analyses are of interest.

Seaweed	Part of plant	Parts per cent				Locality
		Potash	Total soluble salts	Ash	Nitrogen	
<i>Nereocystis</i> sp.	lam.	9.90	25.94	3.88	0.84	Alaska
	»	15.44	39.40	4.34	2.27	
	stem	28.26	52.88	3.60	1.06	
<i>Postelsia palmaeformis</i> . . .	stem	22.8	44.5	3.2	0.94	California
<i>Macrocystis pyrifera</i>	lam.	9.7	29.7	4.3	1.40	California
	stem	18.7	40.3	5.3	1.24	
	stem and lam.	12.4	28.3	6.9	1.04	

(1) See No. 1147, B. Aug. 1912.

(2) See CAMERON F. K. Kelp and other sources of Potash. — *Journal of the Franklin Institute*, CLXXVI, 364, 1913. (Ed.)

From these results and those of eight other samples analysed at the same time, the writer concludes that the nitrogen and the ash content are most invariably larger in the leaves than in the stem of the same plant, and that the total soluble salts and the potash are more abundant in the stems than in the leaves.

Investigations on the Availability of Phosphatic Manures. — JORDAN, W. H. (Studies in Plant Nutrition; I.) *New York Agricultural Experiment Station, Bulletin* No. 358, pp. 30. Geneva, N. Y., February 1913.

Manurial experiments were carried out with (a) superphosphate, ground Florida rock (floats), (c) basic slag, (d) dehydrated Redonda phosphate, (e) bone meal, (f) iron ore waste. The plants were grown in cans and boxes containing either a poor sandy soil or a pure quartz sand, or quartz sand to which 3 per cent. of sphagnum moss had been added, and received in addition to the phosphatic manures other mineral salts to make the manure complete. Cereals, root crops and leguminous fodder crops were used as test plants.

The results point, in the first place, to the general conclusion that the availability of the phosphate is quite as much a matter of the kind of crop as of the form of combination of the phosphoric acid. Cruciferous crops (cabbage and rape) made use of the phosphoric acid in ground rock phosphate without difficulty, while to the cereals (barley, millet and oats) it is practically useless. On the whole superphosphate produced the greatest amount of plant growth, though basic slag was not far behind. Redonda phosphate, though classed below the two above fertilizers, gave better results than ground Florida rock.

The influence of fineness on the availability of phosphates was investigated by using ground rock phosphate and bone meal of various degrees of fineness, varying from a fine powder such as "floats" (which will pass through a bolting cloth) to a texture obtained by passing the manure through a sieve with 60 meshes to the inch. Three successive crops of peat obtained in 1899-1909 exhibited no increase with the more finely divided fertilizers, but when the experiments were repeated in 1903-1904 a more favourable soil produced by the addition of sphagnum moss to the quartz sand, peas, barley and rape all assimilated increased quantities of phosphoric acid as the fineness of the fertilizing material increased, the amount of phosphoric acid yielded by the ground rock "floats" being almost twice as great as that yielded by the coarse material. In the case of bone meal the degree of fineness had much less effect. The proportion of phosphoric acid in the dry matter of the crop increased with the fineness of division of the ground rock, *i. e.* was proportional to its availability.

Manurial tests carried out with an iron ore waste containing 15.45 per cent. of phosphoric acid showed that it was of little use to barley; the following table shows clearly how little adapted cereals are to utilizing the phosphoric acid of mineral phosphates before the latter have been chemically treated.

Relative availability of phosphoric acid from different sources as measured by chemical methods or shown by plant production (monocalcium phosphate taken for comparison).

Method of determining availability	Available phosphoric acid in:									
	Mono-calcium phosphate		Iron ore waste		Basic slag		Ground Tennessee rock		Bone	
	gms	rel. wt.	gms	rel. wt.	gms	rel. wt.	gms	rel. wt.	gms	rel. wt.
1. Official U. S. A.	5.82	100	0.117	2.0	2.49	42.8	0.168	2.9	1.72	1
2. Wagner	5.82	100	0.195	3.3	5.13	88.1	1.25	21.5	5.07	8
Dry matter produced by barley, less amount on checks										
Plant production	32.8	100	6.0	18.3	30.5	93.0	17.5	53.3	36.5	11

214 - **The Solubility of Mineral Phosphates in Citric Acid.** — ROBERTSON, G. in *Journal of the Society of Chemical Industry*, Vol. XXXIII, No. 1, pp. 9-11, Lond. January 15, 1914.

Quite recently artificial manure manufacturers have placed on the market large quantities of mineral rock phosphates as a suitable phosphatic manure. These rock phosphates, in spite of the fact that they are very finely ground, are only slightly soluble in 2 per cent. citric acid. They were therefore assumed to be of little use as an available manure compared with basic slag and bone meal, in which 80 to 95 per cent. of the phosphate are soluble in 2 per cent. citric acid. However, in a series of field trials carried out at Cockle Park (Northumberland) they gave excellent results on grass land, as will be seen from the following summary of the yields obtained:

Field Experiments on Three Years' Ley.

Manure	Number of plots	Total number of years	Average yield of hay per acre
			cwt.
Slag (200 lbs P_2O_5 p. acre)	5	13	40.3
Bone Meal " "	2	5	39.7
Min. Phosphates " "	5	12	41.0
No Manure	2	5	35.2

With the object of finding a satisfactory explanation of the successful results obtained with rock phosphate, calcined and uncalcined samples of the Belgian and Tunisian varieties were subjected to 5 consecutive extractions in 2 per cent. citric acid, which showed that the rock phosphates were completely soluble in citric acid if enough of it be used and enough time spent on the extraction. The first extraction contained more lime than any other and the second and third gave the bulk of the phosphates. As the process rendering the phosphates soluble in the soil is a continuous one, the so-called "citric-insoluble phosphates" give as good results as the citric-soluble slags, the citric acid test, as commonly performed, having been a test for lime content rather than phosphate content. The cost of a unit of phosphate in rock phosphates is only about 9d, but in basic slag it is about 18 4d. It will therefore be readily understood that the use of rock phosphates might prove of considerable economic importance.

Influence of the State of Fineness of Superphosphate and of Basic Slag on their Efficiency. — MIKULOWSKI POMORSKI, J. (Mitteilung der agricultur-chemischen Versuchsanstalt in Dublany) in *Zeitschrift für das Landwirtschaftliche Versuchswesen in Österreich*, Vol. XVI, No. 11-12, pp. 1044-1055, Vienna, November-December 1913.

From the time of Liebig it has been commonly held that fineness of manure is an important factor in the efficiency of superphosphate. The experiments of P. Wagner proved how essential was fineness in the case of basic slag, but there is altogether little experimental evidence on the subject, especially with regard to superphosphate; in order to investigate the matter further, two series of culture trials were carried out with oats. The jars were grown in jars containing 13 lbs. of a loess soil, deficient in phosphoric acid. For the first year's trials, the superphosphate and basic slag were mixed with 3 per cent. of gypsum used as a cement material, pounded up and graded by means of sieves into particles of different sizes (0.5-1 mm., 1-1.5 mm., 1.5-2 mm.), while another portion of the mixture was again reduced to a powder. The second season superphosphate was tested; it was cemented with agar and reduced to particles 0.5 cc. in size and to a fine powder. The manure was applied in the first series by mixing the dressing with the uppermost third of the soil in the jar, but in the second series the dressing was mixed with the entire contents of the jar. Similar tests were carried out with the first series (consisting of 18 units of jars each) on the effect of adding sodium nitrate and potassic salts; in the second series (consisting of 8 units) all jars received the addition of nitrate and potash.

The results show that superphosphate cemented by gypsum to particles 2 mm. in size, or treated with agar, is no less effectual than when in the form of a fine powder; in fact the samples treated with gypsum sometimes gave better results. The depth at which the manure was buried seemed of more importance than its degree of fineness. The phosphoric acid in basic slag, on the other hand, was less available when the manure had been treated with gypsum. From these results the following conclusions are drawn:

a) It is unnecessary to exact a great degree of fineness in superphosphate as up to a certain point a rather coarse texture may be an advantage amongst other reasons because it prevents pasting in the bags.

b) Superphosphate is far better adapted than basic slag for applying in the furrows together with the seeds at drilling time, as the pasting the latter is likely to decrease its efficiency.

216 - **A New Fertilizer: Molassed Superphosphate (Superphosphat schleimig).** STOLTZENBERG, H. in *Chemiker-Zeitung*, Year XXXVIII, No. 8, pp. 81-82. Gt January 17, 1914.

The residues from the distillation of molasses were at one time thrown away, but they were soon recognised to be of manurial value as they contain nitrogen and potash, and were sold to farmers who applied them to such crops as mangolds, potatoes, tobacco and hops, though their sown with rapid decomposition and great bulk prevent their being used very extensively. Most of the sugar factories, however, concentrate and ignite the residues to recover the potash, or sell them in a concentrated condition to cyanamide works, which recover not only the potash but also 60 to 70 per cent. of the nitrogen as potassium cyanide and ammonium chloride. Even in these cases, 30 to 40 per cent. of the nitrogen and all the organic matter are lost, and for this reason efforts have repeatedly been made to transform these residues into a solid easily handled manure, either by drying the material or by mixing it with other substances. So far these efforts have proved unsuccessful, as the product has always been hygroscopic.

The reason for this is the presence in the residues of hygroscopic organic bases, more especially of betaine. Now Andriks has shown that the acid phosphate of betaine is not hygroscopic, and the writer obtained a friable, non-hygroscopic product when he treated the concentrated residues from the molasses with a calculated amount of phosphoric acid and dried the mixture. Better results still were obtained when the residues were mixed with superphosphate and the mixture heated for a short time at 108° C (226° F). The material thus prepared is friable, keeps well and is easy to apply. Molassed superphosphate obtained by mixing 3 parts of superphosphate with 2 1/2 parts of concentrated residues contains 10 per cent. of nitrogen, 6.33 per cent. of potash and 11.53 per cent. of citric soluble phosphoric acid (8.48 per cent. water-soluble), and yields 50 per cent of residues on ignition consisting of soluble calcium-potassium phosphate, potassium and sodium sulphate and chloride, gypsum and non-composed phosphate from the superphosphate. The manure is made up of 50 per cent. of soluble substances and of 30 per cent. of undecomposed organic substance. If required, nitrate of soda, sulphate of ammonium or potash salts may be added in order to increase the nitrogen or potash content. The product does not damage sacks and has the advantage over other fertilizers of providing humus material as a basis for bacterial development in the soil.

Attempts to obtain analogous compounds, such as molassed soluble molassed cyanamide, with a preliminary treatment of the residues to render them non-hygroscopic, have not so far yielded practical results.

Secondary Constituents of Basic Slag. — DEMOLON, A. and BROUET, G. (Station agronomique de l'Aisne) in *Journal d'Agriculture Pratique*, Vol. 138, No. 1, pp. 22-23, Paris, January 1, 1914.

A characteristic feature of present day investigations in soil fertility is the proposed use of fertilizing elements other than nitrogen, phosphorus and potassium, such as, for instance, manganese, boron, zinc, lithium, magnesium, fluorine, sulphur. The majority of agriculturists, however, have not yet been convinced of the utility of these elements in ordinary practice. Basic slag contains not only phosphoric acid but also oxides of manganese and magnesia, derived respectively from the ferromanganese introduced in the converters and from the linings of the converters themselves (see p. 10).

Analyses of Basic Slag carried out at the Experimental Station (Aisne).

Samples	Total Phosphoric acid	Manganese			Total Lime	Magnesia
		Total	sol. in 2 % citric acid	sol. in 3 % acetic acid		
.....	17.40	5.34	1.84	1.47	—	—
.....	18.87	4.72	1.84	1.21	43.00	16.41
.....	15.23	4.72	2.27	1.11	—	—
.....	18.20	4.55	1.61	0.94	—	—
.....	17.65	5.34	3.59	1.27	45.19	3.24
.....	17.80	5.16	2.77	1.30	—	—
.....	17.78	4.72	1.98	1.16	44.80	10.14
.....	18.60	5.20	1.50	1.06	—	4.50
.....	18.16	4.07	1.64	1.08	—	13.86
.....	18.80	4.21	2.67	1.47	—	—
.....	15.35	3.93	2.77	1.44	—	—
ave. of 10 other ferent samples ..	—	4.10	3.59	2.68	48.02	10.05

The above analyses show that the manganese content of basic slag is very constant and in the neighbourhood of 4 to 5 per cent., while its solubility in citric acid indicates that it is present in a condition available to plants. An application of 6 parts of slag would be equivalent to 2 parts of calcined lime, so that if manganese plays a useful role in plant nutrition it cannot be lacking where slag is employed as a manure. The magnesia content of slag is more variable, averaging about 10 per cent.; the lime-magnesia ratio, however, usually remains within the optimum limits laid down by plant physiologists. An application of 5 parts of slag would be equivalent to 1 part of lime-magnesia manure such as is now on the market.

218 - Distribution of Manure in Drills: Results obtained in Experiments with Barley and Sugar Beets at Hatvan, Hungary, in 1912 (1). — JANCsó, István, in *Kisérleti Közlemények*, Vol. XVI, Part 6, pp. 758-776. Budapest, November-December 1913.

Considering the great interest recently shown by Hungarian farmers in the question of distributing manures in drills, and the widely spread use of mixed drills for seed and manure built by several agricultural machine manufacturers, the National Society of Hungarian Agriculturists (Országos Magyar Gazdasági Egyesület) resolved, at the beginning of 1912, to examine such machines of various makes, with the object of examining them from a technical point of view and of determining their value by actual experiments.

The plan of these experiments, conducted on the estate belonging to the Hatvan sugar factory, was drawn up by the Royal Agricultural Experiment Station of Magyaróvár, which was besides entrusted with the execution and supervision of the trials and with the examination of the material tested.

Experiments with spring barley. — These experiments were carried out by five distributors of various systems, but owing to the too frequent rain the barley lodged, especially on the plots manured with chemicals. The yields of the various plots were nearly the same and no decisive result could be arrived at. Nevertheless it was seen that a moderate dose of superphosphate and nitrate of soda given in drills has no ill effect on the germination of the seed, and rather hastens the first development of the young plants.

Sugar beets. — The experiments with beets, carried out on the same plan, were more successful. Each of the five machines had to work up 6 plots, each 1.42 acres in extent, and manured as follows:

Plots 1 and 4	No manure
" 2 " 5	186 lbs. of super and 46 lbs. of nitrate spread broadcast, over the whole surface.
" 3 " 6	93 lbs. of super and 23 lbs. of nitrate in drills.

The machines worked on the 15th and 16th of April.

Observations showed that manuring in drills acts better on the development of sugar beets than manure broadcasted, and its benefits were visible throughout the whole period of growth. On October 7 samples were taken from all the plots; in the sugar content no great differences were noticeable, but as to the size of the beets there was a difference in weight in favour of manuring in drills. In the experiments the average weights were:

	Series of plots	
	I	II
	gram	grams
Without manure	321	321
Manure broadcasted	371	373
Manure in drills	398	395

(1) See also Original Article by C. KERFELY in *B. Nov.* 1914, p. 1696.

The yields per acre averaged as follows:

	Series of plots		Average	Surplus over control plot
	I	II		
	lbs.	lbs.	lbs.	lbs.
no manure, control . .	17 492	17 450	17 470	—
10 lbs. super and 46 lbs. nitric, broadcasted	18 703	18 233	18 468	998
10 lbs. super and 23 lbs. nitric, drilled	19 751	19 406	19 578	2 107

From the above table it will be seen that half the dressing drilled gave a surplus over the control plot more than double that obtained by the whole dose when broadcasted. It must also be mentioned that the sugar beets were affected by the great drought of July and August, without which the yield would have been much heavier.

That the drilled manure produced a better result than twice the dose broadcast might be explained by the supposition that the soil of the Hatvan estate, being rich in humus and well cultivated, did not require a large amount of manure. According to this view the use of a larger quantity of manure broadcasted, the effect of which would be slower but more durable, should have proved more advantageous on poor and badly cultivated soils. But during the course of the experiments this objection was completely removed, quite by chance. The extremities of the experiment plots were formed by a piece of exhausted land belonging to an adjacent estate, which had been only recently rented. As all the plots ended on this land the development of the beets could be observed. Here also the results of manuring in drills were striking throughout the whole time from the germination of the seed to the time of lifting.

	Series of plots	
	I	II
	grams	grams
No manure	117	100
Manure broadcasted	174	186
Manure drilled	226	223

It appears from the above figures that in exhausted soils the drilled manure was more active than twice the amount broadcasted, for while the drilled yielded nearly twice as much as the check plot, the former yielded only three times as much, as is shown by the following figures per acre :

	Series of plots		Average	Surplus over control p
	I	II		
	lbs.	lbs.	lbs.	lbs.
Without manure, control	3 445	3 411	3 428	—
Broadcasted manure	6 740	6 678	6 709	3 281
Drilled manure	9 375	9 362	9 368	5 940

The Hatvan estate having found that drilling manure is more advantageous than broadcasting it, has definitely adopted the former method for all the crops.

219 — **Manurial Experiments in Palestine.** — *Les Mercures Agricoles*, Vol. III, No. 1, pp. 36-39. Antwerp, January 16, 1914.

The following data are taken from the report of Dr. Keller, director of the agricultural school at Wilhelma (near Jaffa), on manurial experiments carried out in 1912-13. They show what an important part fertilizers may be called upon to play in the production of agricultural crops in this country.

Up to the present, fertilizers have only been used by the German colonists, and by native cultivators immediately surrounding the German colonies. Manurial trials have now yielded sufficient data for practical conclusions to be drawn; it is quite evident that only fertilizers increase the yields, as dung, which in Palestine consists of refuse from ruined villages, does not give the same good results. With suitable dressings of fertilizers, yields amounting to 25 bushels of wheat or barley per acre were obtained, although these will certainly be further increased eventually, they already present a distinct advance on the yields of native cultivators, who generally harvest no more than twice the amount of grain originally sown as seed. With the increased fertility of the soil its feeding capacity has also increased and whereas previously 11 acres were considered necessary per head of cattle, now less than 5 acres are deemed sufficient, and sales of produce rose from £1680 in 1910 to £3360 in 1912.

With regard to the manures used, sulphate of ammonia has been most exclusively employed as a source of nitrogen, because the importation of nitrate of soda was prohibited up to 1910, but the price of the former has now risen to such a height that it will be replaced more profitably by nitrate. Phosphoric acid in the form of superphosphate, and 40 per cent. potash salts are the other most suitable manures. For cereals the following dressing is recommended:

- 4 to 5 cwt. superphosphate per acre
- 2 to 4 " potash salts per acre
- 1 " nitrate of soda (as a top dressing)

This would cost 37s. to 39s. per acre.

Manurial trials with sesame and maize have only given negative results so far, possibly because the manures were applied too late in the season and there was not sufficient moisture in the soil to dissolve them properly. The following results were obtained in 1912-1913 on a heavy clay soil which has been in cultivation 8 years and which had received a dressing of guano in 1906.

Crop yields per acre.

Crop	No manure		1½ cwt. nitrate per acre		1½ cwt. nitrate 6 cwt. superphosphate per acre		1½ cwt. nitrate 6 cwt. superphosphate 3 cwt. potash salts per acre	
	tons	cwt.	tons	cwt.	tons	cwt.	tons	cwt.
barley and vetches . . .	1	17	3	3	3	19	4	9
soybeans		10	—			14		15
potatoes	11	5	18	0	23	0	26	11
maize	4	8	—		16	8	—	
root	1	0	—				10	16

- **The Minimum of Plant Food required for Maximum Production.** — JORDAN, W. H. Studies in Plant Nutrition: II. — *New York Agricultura Experiment Station, Bulletin* No. 360, pp. 53-77 + 8 figs. Geneva, N. Y., February 1913.

These experiments were devised with a view to ascertaining the essential minimum amount of available phosphoric acid and potash required to produce maximum growth. The crops used included barley, peas, tobacco, tobacco, buckwheat, rape and turnips.

Two sets of cultures contained all the required elements except phosphoric acid and potash respectively, one of these elements being added in progressive quantities to the several cultures of each set. The conditions of temperature and moisture were under control and were as far as possible regulated so as to fully satisfy the requirements of the plants throughout the experiments. The results obtained show considerable conformity amongst the different crops.

No fixed relation exists between the production of dry matter and the amounts of phosphorus and potash utilised. Up to a somewhat indefinite point the production of plant substance increased in most cases with increase in the supply of the variable constituent, but beyond that point increase in the consumption of both phosphorus and potassium compounds resulted in an increase in the proportion of phosphorus and potassium in the plant tissues and not to a corresponding increase of plant growth.

The results also confirm the conclusion that the chemical analysis of a given crop is no certain criterion of the manurial requirements of that particular crop.

221 - **The Use of Radium as a Means of Forcing Plants.** — MOLISCH, H. in *Naturwissenschaft*, Year II, Part 5, pp. 104-106 + 3 plates. Berlin, January 1913.

The writer has, for more than two winters, investigated the effect of radium upon resting portions of plants of solid radium emanations. The budding of branches of lilac (*Syringa vulgaris*), for instance, was accelerated by the effect of radium, provided they were exposed to its influence at the right season (end of November and in December), and not for too long or too short a time, one or two days being sufficient. Unless these conditions are observed, the preparations had either no effect or a harmful one upon the buds.

The experiments with emanations, which produce a more equal effect upon the buds than can be obtained by the use of solid preparations, were attended with very good results. The longer the emanations lasted (e.g. 48, 72 hours) the greater was their effect.

Not all plants, however, can be forced by radium. The experiment is at present of no practical value, since the same effect can be produced by the use of simpler and less costly means.

222 - **Phosphoric Substances in Meadow Hay.** — DUSERRÉ, M. C. (CHAVAN, P. & TCHUMY, L.) in *Archives des Sciences Physiques et Naturelles*, Year CXVIII, Vol. XXXI, No. 12, pp. 578-581. Geneva, December 15, 1913.

Phosphorus compounds being of great importance in animal economy the writers investigated the compounds of that nature contained in meadow hay. They distinguished three groups of compounds:

1) *Phosphatides*, consisting chiefly of lecithins and extracted by boiling in alcohol.

2) *Phosphates*, soluble in dilute acids, together with *phytin* which decomposes into phosphoric acid and inosite.

3) *Nucleo-proteids* or proteins, insoluble in the above reagents.

Various samples of hay from different meadows were examined and the phosphorus content was distributed as follows:

	I	II			III
		1910	1911	1912	
Phosphorus in the form of:	per cent	per cent.	per cent.	per cent.	per cent
Lecithins	4.0	4.0	7.8	6.8	6.3
Phosphates and phytins	54.3	55.8	62.1	61.1	54.3
Nucleo-proteids	41.7	40.2	30.1	32.1	38.4

These results show that more than half the phosphorus in hay is present in the form of phosphates and phytins, and that 30 to 40 per cent. in the form of nucleo-proteids, while the amount in the form of lecithins is less than 10 per cent.

The application of phosphatic manures to meadows increases the phosphorus content of the hay, more especially that part present in the form of phosphates and phytin, as shown in the following tables.

	I			II		
	Yield of hay per acre	Phosphorus		Yield of hay per acre	Phosphorus	
		per cent. in hay	lbs. per acre		per cent. in hay	lbs. per acre
	cwt.			cwt.		
manured	19.9	0.108	2.41	11.9	0.157	2.09
erphosphate. . .	20.3	0.191	4.73	24.3	0.235	6.40
assic super . . .	29.4	0.199	6.55	31.9	0.233	7.96

Assuming that lecithins and nucleo-proteids have a mean phosphorus content of 4 per cent. and 5 per cent. respectively, and that all the phosphorus extracted by dilute acids be in the form of phytin, the production per acre of the various groups of phosphorus compounds was:

	II			III		
	Lecithin	Phytin	Nucleo-proteids	Lecithin	Phytin	Nucleo-proteids
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.
manured	4.10	5.64	15.79	3.52	4.39	16.02
erphosphate . . .	6.11	13.38	20.02	9.32	15.21	41.16
assic super . . .	8.47	18.38	28.44	17.62	17.33	54.73

The application of phosphatic manures to meadow land, supplemented when required by potassic and nitrogenous fertilizers, therefore increases considerably the amount of phosphatic compounds produced on a given area, the forage being not only more abundant but also richer, and permitting more intensive feeding of the grass land.

Characters of the Grain in Varieties of Hungarian Pedigree Wheat and their Hereditary Transmission. — OBERMAYER, ERNŐ in *Köntelek*, Year 23, No. 93, pp. 3133-3134. Budapest, November 29, 1913.

The writer gives an illustrated description of the grains of the pure types obtained by pedigree selection of the Diószag and Somogy Hungarian hard wheats, and demonstrates that the various forms selected from the same variety differ not only in their development and in the morphological peculiarities of the plants, but also in the character of their grain. In order to determine these differences, the writer discusses the visible variations of form of the seeds (long, short, etc.); he shows that though the weight and colour of the grain are subject to some change according

to the seasons, these characters, and still more the form of the grain, show uniformity in all the descendants of each of the pedigree types and are transmitted pure. The hereditary transmission of the characters of seeds was determined according to the examination of the crops harvested in 1910, 1911 and 1912.

224 - Increase of the Productivity of Hungarian Wheat by Means of Selection
— GRABNER, EMILE in *Köztelek*, Year 23, No. 99, pp. 3337-3338. Budapest, December 24, 1913.

The productivity of Hungarian wheat not being susceptible of increase by the development of its tillering, on account of the consequent late ripening, the writer recommends the selection of ears bearing three or four grains per spikelet, instead of the two usual in Hungarian wheats. Among the pure types obtained by the selection of Hungarian wheat (effected at the Hungarian Station for Plant Selection), and the characters of which differ essentially, there are several which answer to the above requirement. Notwithstanding the climatic conditions during flowering time, frequently injurious to pollination, the spikelets of these selected types are distinguished by a large number of grains: three and four, rarely five, in which case they are very small.

225 - A Many-eared Variety of Maize obtained by Selection in Hungary.
GRABNER, EMILE in *Gazdasági Lapok*, No. 51, p. 850. Budapest, 1913.

In 1911 the seeds of 25 ears of Pignoletto maize taken from plants bearing four ears, selected in 1910, were sown in the experiment fields of the Royal Hungarian Institute for Plant Selection at Magyaróvár. The numbers of stalks obtained in 1912 are shown in Table I.

The parent ears classed in the first and second groups are the descendants of two of the ears of a stalk bearing four ears selected in 1910, while the third group comprises the descendants of the two other ears of the same stalk.

In 1913 the seeds from the stalks with 7 and 12 ears mentioned in Table I were sown; whilst in the plants of the 1912 harvest the majority of ears did not grow directly on the main stalk but on the longer side shoot in the 1913 crops as well as in the parent plant of the first selection (1910) the stalks bore the ears directly on the main shoot.

The hereditary transmission of the number of ears on the 1913 crop is shown in Table II.

Number of ears on the stalk	No. of parent ear																			
	1st group								2nd group								3rd group			
	I	II	III	IV	V	VI	VII	VIII	IX	I	II	III	IV	V	VI	VII	I	II	III	IV
1	8	4	11	11	11	12	18	13	12	13	21	20	12	8	20	14	7	20	20	11
2	39	34	27	29	20	31	29	31	31	30	24	25	18	28	26	26	34	25	24	23
3	3	10	4	9	10	10	7	9	11	10	9	4	14	9	4	4	7	5	7	10
4	—	2	2	3	5	1	2	3	5	3	3	—	6	1	3	1	4	2	3	4
7	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—
12	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—

N.B. The Arabic figures in the various columns represent the number of stalks obtained.

TABLE II

Number of ears on the stalk	Parent plant with 7 ears						with 12 ears			
	I	II	III	IV	V	VI	I	II	III	IV
1	8	6	20	9	4	5	13	21	14	19
2	10	24	34	33	11	15	14	7	9	6
3	14	13	14	9	9	1	4	2	—	1
4	7	10	4	4	—	—	—	1	—	—
5	1	2	2	1	—	—	—	—	—	—
6	5	—	—	—	—	—	—	—	—	—
7	—	—	—	—	—	—	—	—	—	—
	1	—	1	—	—	—	—	—	—	—

The yield of stalks obtained from the ears no I. of the parent stalk with 7 years shows the excess of stalks bearing more numerous ears over those bearing one or two ears.

Average yield of whole ears.

	grams
Stalk with 1 ear	81.3
" " 2 "	128.4
" " 3 "	182.5
" " 4 "	220.8
" " 5 "	253.6
" " 6 "	247.8
" " 8 "	189.7

The much lower yield of the stalk bearing 8 ears is due to the fact that 4 of the ears remained sterile.

226 - **Plant Breeding and Selection in New Zealand.** — GREEN, A. W. in N. Zealand Department of Agriculture, *Journal of Agriculture*, Vol. VII, No. 5, pp. 482-4 Wellington, November 1913.

Selection experiments are in progress with all the more important farm crops, fruits and vegetables. The main object at present is the isolation of disease-resistant forms. Up to the present time, success has been achieved in the production of a new rust-resistant variety of oats (known as Ruakura Rust-resistant) from a single head selected in 1908. Over 100 acres are now under this crop at Ruakura alone, and some 220 farmers have received free samples.

- Cultivation Experiments with Loose-Eared Varieties of Winter Wheat.—

MUNDT, L. in *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Part 248, Berlin, 1913.

In this publication, the writer gives a summary and account of the results of the experiments carried out with loose-eared varieties of winter wheat by the German Agricultural Society (*Deutsche Landwirtschafts-Gesellschaft*) in the years 1908-1910. The experiments extended throughout Germany, which is divided into 12 cultural districts. In 1908, 25 reports were sent in; the number of experimenters rose in 1909 to 37, and in 1910 to 13.

These experiments are of the greatest importance to the experimenter, whereby he ascertains, in the simplest and surest manner, the varieties which are most suitable to his farm. They are also of great general importance, for they are carried out in the most different districts of Germany under the most various conditions of soil, climate and cultivation, and thus valuable as a means of ascertaining the characteristics of the different varieties.

The experiments described by the writer are partly principal experiments, and partly preliminary trials of new varieties. In the principal experiments the following wheats were grown for comparison: Orig. Rimpau's Hybrid, Orig. Crieuener 104, and East Prussian Epp.

Considering only the thoroughly reliable experiments, the following average yields of grain (in lbs. per acre) were obtained:

	Rimpau's Hybrid	Crieuener 104	E. Prussian Epp
1.	2936	2545	2523
2.	2246	2402	2181
3.	2086	2237	1976

It is thus seen that Rimpau gave the highest yield in 1908 and Crieuener in the other two years. As regards straw yield and duration of growth there is little difference between the three varieties; the same may be said in respect to resistance to disease. As the winters during which the experiments were made happened to be very mild, little can be said as to the capacity of these wheats for withstanding cold; the most resistant was, on the average, the East Prussian Epp wheat. Crieuener 104 takes the first place as regards resistance to lodging, the worst being East Prussian Epp. In respect to the flintiness of the grain, Rimpau's Hybrid was far superior to the two others; this, together with its higher gluten content, is the best evidence that it will produce the finest flour for bread making.

Preliminary experiments were carried out in these years with eight other varieties. A final decision as to their value cannot yet be made; this, further and more extensive experiments are necessary.

228 - Studies on the Stem-Anatomy of Wheat and its bearing on Classification. — BLAIRINGHAM, L. and MIEGE, E. in *Comptes-Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 157, No. 25, pp. 1457-1460. Paris, December 22, 1909.

The classification of the varieties of wheat belonging to the species *vulgare*, *compactum*, *dicoccum*, *turgidum*, etc., has not yet been satisfactorily achieved. In spite of numerous attempts at classification by various authorities, considerable doubt remains as to the actual value of the various subdivisions. With a view to throwing some light on these difficulties, the writer has made an anatomical study of the stems of numerous varieties of wheat.

He finds that:

1) The differentiation of the tissues increases in passing down the stem and is more pronounced in winter than in spring wheats. This differentiation consists in a thickening of the cell walls, an increase in the number and size of the vascular bundles, and a wider distribution of the naturally associated with a thicker stem.

2) The anatomical structure of the stems of *T. spelta*, *T. durum* and *T. monococcum* is very uniform and distinct, especially with regard to the number, dimensions and distribution of the vascular bundles.

3) The stem structure of *T. vulgare*, *T. dicoccum* and *T. turgidum* is far from constant; various strains of them show affinity in this respect with the above-mentioned species.

4) Hybrids between *T. monococcum* and *T. durum* have the characters of *T. dicoccum*, and crosses of *vulgare* × *turgidum* resemble *spelta* and *durum* wheats.

Thus it would appear that such polymorphic species as *dicoccum*, *turgidum* and *vulgare* have originated as hybrids. These results support Naudin's theory, according to which the stem structure of hybrid wheats would be a heterogeneous and unstable mosaic of characters occurring in a stable form and inherited without change in the forms *spelta*, *durum* and *monococcum*.

229 - Observations on some Characters of Hard and Tender Barleys. — T. H. C. A. in *The Journal of the Institute of Brewing*, Vol. XIX (Vol. X. N. S.), No. pp. 413-452 + 3 plates. London, October 1913.

With a view to extending our knowledge of the factors causing "stiffness" or "hardness" in barley, the writer has made a detailed histological examination of numerous grains of hard and soft or mealy barley from different harvests and different countries. It has long been known that harvests unfavourable to the proper maturation of the grain give rise to a greater percentage of hard grains of inferior malting quality. This inferiority has been chiefly attributed to the condition of the gluten and nitrogen content of the grain.

The writer's investigations show that among other factors the following are very important: 1) the condition of the cell walls of the endosperm and 2) the size of the starch granules.

By means of suitable staining and microchemical tests he has shown 1. That the cell walls of the endosperm consist of resistant laminae and

by more plastic layers, and that the disintegration of these laminae by enzymes during the process of malting and brewing is more difficult much less complete in hard than in tender ones.

2. That the proportion of small or rudimentary starch granules is much larger in hard than in tender barleys; these small granules, owing to the presence of an intact outer covering or cellulose envelope, are much more resistant to the action of enzymes, moisture and temperature than the larger granules of normal size.

Further investigations are being made concerning the percentage of asphoric acid.

- Eight Years' Cultivation Experiments with Beans. — ZIFFER, A. *Arbeiten der Deutschen Landwirtschafts-Gesellschaft*, Part 249, Berlin, 1913.

This paper is the first detailed report on the results of experiments on the cultivation of several varieties of horse beans conducted by the German Agricultural Society (Deutsche Landwirtschafts-Gesellschaft), in cooperation with other bodies, from 1905 to 1912. The experiments were carried out on a uniform plan and as they extended all over Germany and under the most varied soil, climatic and economic conditions, they are of the greatest importance for forming an opinion as to the merits of the different varieties. The writer discusses, in the introduction, the principles according to which the experiments were conducted; he further gives a sketch of the weather conditions during the years that the experiment was carried out, and an exhaustive description of the different varieties tried.

The experiments were divided into preliminary and main experiments, the years 1905 only the former were carried out and with the following varieties: Eckendorf, Small Thuringian, Halberstadt and Dutch Marsh beans. During these preliminary experiments the Small Thuringians were first tried as to yield and may be considered as the most productive; second place was occupied by the Halberstadt beans and the third by the Eckendorf. The yields of the Dutch marsh beans varied very much and did not allow of any reliable conclusions being drawn.

On the basis of these preliminary trials the varieties selected for the main experiment during the period 1906-08 were the Eckendorf, the Small Thuringian and the Dutch marsh beans. According to these experiments the Eckendorf and the Small Thuringian seem to have the same value as regards productivity under favourable conditions of growth. The Small Thuringians require less water than the others and therefore thrive better in dry years and on dry soils. Under less favourable conditions the Dutch marsh bean is a valuable variety, at least equal to the Eckendorf, and superior to the Small Thuringian.

The Halberstadt bean was substituted for the Dutch marsh bean in the main experiment during the years 1909-12. The results of this period agree with those of the previous one, inasmuch as the Small Thuringians in dry years prove superior to the Eckendorf beans. The Halberstadt beans revealed themselves as fairly productive, but require more moisture than the Small Thuringians. The yields of the several varieties, as well as those

of each year and the averages for both periods of experiment, are collected in tables. As the value of a variety does not depend only upon the yield, but also upon other useful characters such as the composition of the crop, and resistance to plant diseases and to lodging, observations on these qualities also were made during both experiments. With the help of these results any farmer can easily find out which are the most suitable varieties for his farm.

Together with the determination of the agricultural value of the several varieties, experiments were also made as to the effect of the sulphate of copper against leaf aphids. As an appendix, a table containing results of this treatment on the yields of grain and straw of several kinds of beans is attached to the report. On the Eckendorf, Dutch and main seeds the copper sulphate treatment was injurious to the yield of grain and of straw, in all cases. With the Small Thuringians and Halberstad the yield was in some instances higher than on the plots which had not been treated.

231 - **The Tepary, a New Cultivated Legume from the South-West States.** FREEMAN, C. F. in *The Botanical Gazette*, Vol. LVI, No. 5, pp. 395-417 + figs. 1 Chicago, November 1913.

The writer describes a new bean occurring in the south-west of the United States. On account of its resemblance to *Phaseolus acutifolius* Gray, and its larger dimensions he proposes to call it *P. acutifolius* var. *latifolius*. It is grown by the Indians and Spanish settlers throughout Arizona and northern Sonora and is noted for its drought-resistant qualities. The seed has a high specific gravity (1.33) and absorbs moisture very rapidly, thus enabling it to germinate during the short periods of rainfall of arid climate. It yields a gelatinous extract in water and is much prized by Mexicans for use by Indians in the preparation of soups.

232 - **Mutations of Tuberous Species of *Solanum* produced under Cultivation (1).** — HECKEL, E. and VERNE, C. in *Bulletin des Séances de la Société Nationale d'Agriculture de France*, Vol. LXXIII, No. 8, pp. 612-628. Paris, October 1911.

This article is an account of the results obtained in culture experiments with several tuberous species of *Solanum* collected by Cl. Verne in the Cordillera (Chile, Peru, Bolivia) in 1911. The experiments were conducted at the Botanic Gardens of Marseilles and Montpellier and in horticultural establishments at Gières and St. Martin d'Uriage.

The following species gave rise to mutations under cultivation.
Solanum immite. — The mutants consist of round yellow tubers of good appearance, which develop early, producing a haulm of a distinct type, resistant to *Phytophthora*.

S. Jamesii. — This species resisted the effects of good cultivation for three years, but later with heavy dressings of poultry manure produced a new kind of tuber, yellow in colour, round in shape, with soft flesh

(1) See also: No. 2560, *B.* Aug.-Sept.-Oct. 1911; No. 68, *B.* Jan. 1912; No. 24, *B.* Jan. 1913; No. 655, *B.* June 1913.

hout prominent lenticels. No change has taken place in the characters of the haulm, since they agree with the description given by Baker in 1884.

S. tuberosum. — This species responds very readily to treatment and we rise to mutations in both tubers and haulm in the first years. Plants grown from tubers from different sources (Bolivia and Peru) have been described by Bitter as belonging to two new species, viz. *S. acaule* and *S. mems*. The author agrees with Weddel and Dunal in regarding the former an alpine form of *S. tuberosum* and as a result of his experiments proposes to describe it as var. *caulescens*. This subspecies shows great promise, produces a luxuriant haulm of a height of 3 feet or more and during a severe outbreak of *Phytophthora* when all types of *S. Commersoni* and *Maglia* and the wild *S. Bitteri* were badly attacked, this species remained perfectly healthy during August and September, in spite of warm dry weather.

S. Maglia. — Incomplete mutation took place in this species. Numbered tubers were produced of a deep violet colour with streaks of yellow. Considerable shortening of the stolon took place, and in some the lenticels were less prominent.

S. Commersoni. — Five tubers of a new type were obtained at Montbrier. They were of a greyish yellow colour and produced plants more resistant to *Phytophthora*. Samples were exhibited at the show of the "Société viticole et horticole du Beaujolais", at Villefranche-sur-Saône, in August, and they appear to have entered into cultivation in this district.

S. Bitteri. — This species shows little tendency to produce mutations. Transplanting it from Marseilles to St. Martin d'Uriage appeared to have effect on the stability of its characters. Some of its tubers have shown a slight tendency to form areas with fewer lenticels. The tubers are yellow lifting, but turn a deep violet colour on exposure to the air.

The writer does not agree with the theory that *S. tuberosum* is the only possible origin of the cultivated potatoes of the world, nor with the belief of many botanists that the numerous wild tuberous species of *Solanum* are incapable of the cultural modifications undergone by the ordinary cultivated species.

- **The Artificial Ripening of Cotton.** — *The Textile World Record*, Vol. XLVI, No. 3, pp. 64-65. Boston, December 1913.

The question of ripening is one of the most important in the cultivation of cotton. An American inventor seems to have found a process of ripening cotton by artificial means, which would allow all the bolls to be gathered at one picking. L. De Costa Ward, of the Philadelphia Textile School, has tested bolls matured naturally and others artificially by the Hall process. They showed practically the same length of staple in all cases, with the artificially matured fibres possessing greater strength. A seed from the bolls was tested by M. J. Williams, Government chemist, and reports that the oil and fat in the artificially ripened seeds was 2.32 per cent. higher than in the naturally ripened ones.

- 234 - Experiments in Hungary with Hemp Seed from Asia Minor and Italy. — GASZNER, KÁROLY in *Köztudomány*, Year 24, No. 4, p. 84. Budapest, January 10, 1914.

During the last three years the writer has conducted a series of comparative experiments with two varieties of hemp: one from Turkey in Asia, the other from Italy (Bologna). Of both varieties 62 lbs. per acre were sown in rows $4\frac{3}{4}$ inches apart on several fields of 57 to 72 acres in area. The two varieties were sown at the same time and under similar conditions. In the Asiatic variety germination began 8 or 9 days after sowing, in the Italian 2 to 3 days later. The Asiatic hemp showed a more rapid development than the Italian, its stalk became thinner and more flexible and at the approach of flowering time it turned light green, while the Italian hemp kept its dark green colour to the end. On August 1, the beginning of the harvest, the Asiatic hemp was about 6 inches taller than the Italian and in spots where the soil was most suitable it attained 10 feet in height. The result obtained from the two varieties shows also some difference: in 1912 the crop of Asiatic stalks was 186 lbs. per acre in excess of the Italian, and in 1913, 288 lbs. (The average quantity of hemp harvested in 1912 was above 83 cwt. per acre). The difference in the yield of the two varieties may be attributed to the denser germination of the Asiatic hemp.

From these experiments the writer draws the conclusion that for the soils of Hungary, Asiatic hemp is more suitable. Its stalk becomes taller and it yields a finer and longer fibre, more suitable for the textile industry than the Italian variety. Nevertheless, the Asiatic seed has not yet been selected, as attention has only recently been paid to it. This is a task the recently created Royal Hungarian Institute for the Cultivation of Flax and Hemp.

- 235 - Some New or Little-known Oil Seeds and Oils. — *Bulletin of the Imperial Institute*, Vol. XI, No. 4, pp. 559-574. London, October-December 1913.

Safflower (*Carthamus tinctorius* L.) has been grown experimentally in Nyasaland; a sample of its seeds received for examination was quite similar to the Indian safflower seed of commerce. It yielded 29.6 per cent of oil. Submitted to valuation by experts it was reported about equal in value to the Indian seed.

Amoora Rohituka W. and A. (Meliaceae) is found in Northern Eastern Bengal and Assam. The seeds yielded 42.5 per cent. of a clear yellow-brown oil, with an unpleasant smell and bitter taste. On germination it gave the following results:

Specific gravity at $\frac{15.5^{\circ} \text{ C}}{15.5^{\circ} \text{ C}}$	0.930
Solidifying point of fatty acids	32.4° C
Acid value	24.7
Saponification value	192.3
Iodine value	per cent. 131.7

This oil could be used for soap making, but its flavour and acidity render it unsuitable for edible use. The residual cake would be useless.

ling cattle on account of its taste; and of very little value as manure. April 1913 the seed was valued at about £ 9 per ton in the United King-

¹ *Eruca sativa* Mill., is a Crucifer extensively cultivated in India. The is examined yielded 30.8 per cent. of clear yellow oil with a slightly stard-like smell and taste. The following are the results on examination :

Specific gravity $\frac{15.5^{\circ} \text{ C}}{15.5^{\circ} \text{ C}}$	0.915
Acid value	2.4
Saponification value	175.7
Iodine value	per cent. 101.6

This oil could probably be used for the same purposes as rape and a oils.

Samples of *Calophyllum Inophyllum* seeds and kernels from India ded from 55 to 71.4 per cent. of oil according to the drier or moister dition of the samples. The oil is viscous, greenish yellow, semi-solid rdinary temperatures. The results of examination were the following :

Specific gravity $\frac{100^{\circ} \text{ C}}{15.5^{\circ} \text{ C}}$	0.880
Solidifying point of fatty acids	36.3° C
Acid value	45.9 to 77.5
Iodine value	per cent. 93.1 to 97.7
Saponification value	192.8 to 202.9

The oil is of excellent quality for soap making, but would be useless for ble purposes if the acid value were as high as in the present samples ; he fresh seeds or kernels were shipped and handled quickly this might haps be avoided. In April 1913 the kernels were valued at £ 16 per i in the United Kingdom. The residual cake, probably only suitable manure, might be worth about £ 2 per ton.

Kernels of *Mesua ferrea* seeds from India yielded 7, to 76 per cent. oil, corresponding to 46 to 49 per cent. from the whole seed. The constants the oil were as follows :

Specific gravity $\frac{100^{\circ} \text{ C}}{15.5^{\circ} \text{ C}}$	0.932
Solidifying point of fatty acids	30.5° C
Acid value	16.2
Saponification value	204.9
Iodine value	per cent. 92.2

This oil could be used for burning or lubricating and probably for soapandle manufacture. It appears that the cake cannot be utilized as a sting stuff. It would be preferable to export the kernels and not the e seeds, as the shells are of no commercial value and only increase the

cost of transport. The kernels are worth £ 17 to £ 18 per ton in the United Kingdom.

Illipe oil from the kernels of *Bassia latifolia* from Mauritius differs somewhat from that from Indian kernels, but it yields a good hard yellow soap and for this purpose could realise about the same price as the palm oil.

Pentadesma butyracea is known as "butter or tallow tree" in Sierra Leone. Kernels from the Gold Coast and from Southern Nigeria show very unequal quality. Consequently, for exportation, only mature kernels should be collected and they should be thoroughly dried in the sun before being shipped. The fat is stated to be highly coloured and to require refining before it can be used to advantage in soap making. The kernel would probably be worth £ 8 to £ 10 per ton in the United Kingdom.

236 - Some New Tropical Oil Seeds. - HEBERT, A. in *Journal d'Agriculture tropicale* Year 13, No. 150, pp. 358-362. Paris, December 1913.

West Africa. - The fruits of *Pentadesma leucantha* A. Chev. contain 10 ovoid seeds each weighing about 20 grams. These seeds, when crushed and treated with benzine, yield about 50 per cent. of a fatty substance, the constants of which have not yet been determined.

An undetermined species of *Carapa* (Meliaceae) produces a seed containing a kernel weighing about 5 gms. and about two-thirds of the whole seed. These crushed kernels yield, on extraction by benzine, 38 per cent. of a fat which is yellowish white, and melts at 21° C. Its density when melted is 0.80 and its constants correspond to those of a slightly drying oil; owing to advantageous yields, it might be put to the same uses as most of the vegetable butters.

The fruits of *Sorindeia oleosa* A. Chev. contain in their kernel a brown fat; its density is 0.889 at 17° C.; it melts between 16 and 17° C.; it resolidifies between 12 and 13° C.; its constants approach those of oils possessing a certain degree of drying properties, and it could be utilized.

The kernel of *Lophira procera* represents about 75 per cent. of the seed which averages 0.83 gm. each; these kernels yield more than 55 per cent. of a consistent cream-coloured fat, which is especially suitable for the manufacture of soap. The seeds of *Lophira alata* yield less (40 per cent.) of a similar fat. The cakes are not utilisable as food for live stock on account of their bitter and astringent taste. For the manufacture of soap this fat is said to be equal in value to palm oil.

Madagascar. - Two Clusiaceae, *Symphonia leavis* and *S. Lowei* : described by MM. Jumeille and Perrier de la Bathie, yield seeds containing a certain proportion (35 to 40 per cent.) of a dark yellow fat, of pasty consistency, its density is between 0.872 and 0.879 at 20° C. and it melts at 15 to 16° C. Its high oleic acid content (60 per cent.) indicates its possible use in the manufacture of soap, and the high melting point (55° C.) of the mixture of acids renders it suitable for stearine works. These seeds thus present much interest from the point of view of their industrial utilization. Unfortunately the number of trees which produce them tends to diminish in consequence of the continuous deforestation of the eastern slope of Madagascar.

***Acrocomia sclerocarpa* and Gru-Gru Oil (2).** — KNAPP, A. W. in *The Journal of the Society of Chemical Industry*, Vol. XXXIII, No. 1, p. 9. London, January 15, 1914.

The writer describes *Acrocomia sclerocarpa* as a tree belonging to the nut palm family. Its trunk is generally swollen in the middle and circles of sharp spines at intervals, thus making it impossible to climb. Leaflets are thinner than those of the coconut palm and the leaves are to possess a very delicate fibre. The fruits are oblate spheroid in shape, about the size of a large plum and dark green in colour. The skin is very tough, but if the fruits are allowed to fall to the ground, this rots leaving the nuts behind, the kernels remaining sweet. The shell of the fruit is about $\frac{1}{8}$ inch thick and hard; the kernel ($\frac{5}{8}$ inch across) has the appearance and flavour of coconut, but is tougher and more transparent. Fruit: length $1\frac{1}{2}$ inch, breadth $1\frac{3}{4}$ inch, weight 30 gms., pericarp 3.8%, shell 31.30%, kernel 8.97%. The pulp of the pericarp yields 10% per cent. of dry ether extract. The kernel contains:

	per cent.
Fat (petroleum-ether extract)	49.13
Water	8.14
Albuminoids	13.70
Fibre and unestimated	29.03
	100.00

One tree bore nine large bunches, each containing about 400 fruits. The kernels were collected in March and on pressing when hot yielded an oil having the following properties (table, p. 364).

The writer concludes that this oil is identical with Mocaya oil of Paraguarí and the oil from the macasuba palm of Surinam. It is very similar to coconut and palm-kernel oils in both organoleptic and analytical tests, consisting chiefly of laurin and myristin. It contains about 12 per cent. of olein than coconut oil, and hence should have about the same value as palm-kernel oil. Its soap is almost white and has excellent lathering properties, while the "stearine" should make a good edible fat.

Though the tree is widely distributed in the West Indies and South America, and appears to grow on the poorest soils, large quantities of the seeds and oil are difficult to obtain.

¹ See also No. 28, *B.* Jan. 1914.

	Oil	Insoluble fatty acid
Colour	very pale yellow	white
Odour	like coconut oil	like coconut fatty acid
Taste	ditto	ditto
Specific Gravity $\left(\frac{99^{\circ} \text{C.}}{15.5^{\circ} \text{C.}}\right)$	0.861	0.838
Melting point	26.0° C	24.0° C
Titer	—	23.05° C
Iodine value (Wijs)	19.4	20.3
Refraction at 40° C.	36.95	19.7
Saponification value	243.5	—
Reichert-Meißl value	7.2	—
Polenske value	13.9	—
Shrewsbury and Knapp value	163.0	—
Neutralisation value	—	261.0
Mean molecular weight	—	214
Free fatty acids (as oleic)	0.62 %	—

238 — **Baobab Fruits and Seeds from the East African Protectorate.** — *Bulletin of the Imperial Institute*, Vol. XI, No. 4, pp. 583-586. London, October-December 1913.

The low oil content of baobab seeds does not allow them to be exported to Europe, but they can be used on the spot as food for live stock softening the integument by boiling. They contain 3.5 per cent mineral matter, and their ash, which is rich in potash (31. per cent.) and phosphorus pentoxide (34.2 per cent.), may be utilized as manure.

The husk of the fruit may be used as fuel, and its ash is a rich potash manure (47 per cent. of potash).

Though the pulp contains a certain amount of free citric acid, the extraction of this is not remunerative on account of the presence of a large deal of pectic substances. The pulp does not seem to be utilisable by the colony, where it is used to coagulate rubber.

239 — **Contribution to the Study of *Hibiscus cannabinus* L.** — *VUEZ, L'Agronomie coloniale*, Year 1, No. 6, pp. 161-163. Paris, December 1913.

This paper contains the results of the examination of seeds of *Hibiscus* as to their oil content. Owing to the difficulty of husking, the analysis was made on the whole seed. It yielded the following results:

Water	9.64
Mineral matter	6.40
Fat	20.32
Proteids	21.14
Saccharifiable matter	15.66
Crude fibre	12.90
Undetermined	13.94
	<u>100.00</u>

Another sample contained only 17.14 per cent. of fat. The fat is a drying oil of a light yellow colour. It appears that it could be applied in the colour and varnish industries. As the seeds can be used as poultry without ill effects, it is believed that the cake could be used as food for live stock. The average yield of an acre of "Da" (the *Somonos* for this plant) in the Niger valley is about 450 lbs. of seed.

Utilization of Para Rubber Seed. — *Bulletin of the Imperial Institute*, Vol. XI, No. 44, pp. 551-559. London, October-December 1913.

Oil. — Para seed oil is a drying oil which dries less quickly than linseed oil, but when the latter is high in price it could be substituted advantageously by Para seed oil. Submitted to several industrial firms, oil has shown itself suited to various purposes. For soap making it about the same value as cottonseed oil.

Cake. — Two series of feeding trials have been carried out with Para seed cake and its value as a food for cattle has been clearly established; in general the animals seemed to relish it. The composition of Para seed cake is not very dissimilar from that of linseed cake, the difference being in favour of the former as is shown by the following table.

	Para rubber seed cake		Linseed cake
	Per cent.		Per cent.
Moisture	6.91	to 8.75	11.6
Crude proteins	29.93	" 30.19	29.50
Fat	8.71	" 17.68	7.50
Starch, etc. (by difference) . .	35.97	" 41.74	35.54
Fibre	4.82	" 5.01	9.10
Ash	4.69	" 5.60	5.20

Experiments on Tapping Manihot. — ZIMMERMAN, A. in *Der Pflanzler*, Year 9, No. 12, pp. 585-597. Daressalam, December 1913.

1. — *Frequency of tappings of Manihot Glaziovii.*

Experiments at Inubesa. — The trees of the Inubesa Rubber estates were divided into four lots and tapped at different intervals: I twice a week, lot II once, lot III once every two weeks, and lot IV once every four weeks. In order to facilitate the study of the yields, the experiments were divided into periods of about 7 weeks (7 periods per year). The average girth of the trees was about 21 inches.

If the accidental variations due to climate are neglected, the table shows the superiority of the yields obtained during the first year by means of a tapping once a week (lot I), but at the same time it shows the progressive weakening of lot I in consequence of the too frequent tapping, whilst lot IV shows a gradual increase of its yield.

According to the figures obtained during the beginning of the second year of experiment the writer has calculated the probable yield in grams for the year (Table II).

TABLE I. — *Yield of moist rubber, in grams per tree per period.*

Period	Lot I	Lot II	Lot III	Lot IV
1	105.8	49.8	22.4	18.4
2	76.4	48.0	22.9	11.3
3	50.6	37.7	26.4	11.6
4	55.1	40.2	19.4	12.9
5	66.6	38.6	23.4	12.1
6	80.5	42.7	27.6	14.8
7	32.0	21.3	13.6	14.0
Total of first year	467.0	278.3	155.3	87.3
8	68.9	41.8	30.6	16.5
9	65.1	43.3	29.1	15.1

TABLE II.

	Lot I	Lot II	Lot III	Lot IV
Yield per tree during 1st year	467.0	278.3	155.3	87
Yield per tree during 2nd year	296.4	250.9	212.9	138
Average yield per tapping per tree during the first year	4.34	5.35	5.97	6
Average yield per tapping per tree during the 2nd year	2.85	4.44	7.65	11

One important fact in favour of not too frequent tapping is the superiority of the average yield per tapping observed in lot IV during the year.

2. *Experiments at Amani.* — The trees, four-and-a-half years old averaging 20 to 22 inches in girth, were divided into three groups tap as follows: Lot I twice a week, lot II once, lot III once every two weeks. Table III has been prepared like Table II.

TABLE III.

	Lot I	Lot II	Lot III
Yield in grams for the 1st year	460.8	330.2	183.0
Yield in grams for the 2nd year	218.0	317.2	231.0
Average yield per tapping per tree for 1st year	4.5	6.4	7.0
Average yield per tapping per tree for 2nd year	2.1	6.1	8.0

The Amani experiments confirm those of Inuhesa: Trees tapped 104 times a year gave yields showing a considerable progressive diminution. In these experiments it appears that the number of 26 tappings per year will give the best results for a long period, but only time will show if this expectation is justified.

11. Influence of the distance between the trees on the yield of latex.

The following yields of moist rubber per tapping per tree were obtained at various distances of planting.

	gms.
5 X 5 m. (16 ft. 8 in. X 16 ft. 8 in.)	5.6
5 X 2.5 m. (16 ft. 8 in. X 8 ft. 4 in.)	3.9
2.5 X 2.5 m. (8 ft. 4 in. X 8 ft. 4 in.)	3.3
2.5 X 1.25 m. (8 ft. 4 in. X 4 ft. 2 in.)	2.1

On equal areas, the close-planted trees yield most up to the present.

Purchases of Tobacco made by the State Monopoly in Hungary in 1912. (1)
[Extract from the publication of the Central Direction of the State Monopoly in Hungary] in *Volkswirtschaftliche Mitteilungen aus Ungarn*, Year VIII, Part XII, pp. 1260-1266. Budapest, December 1913.

In 1912, 10787 Hungarian tobacco growers produced in 940 communes, an area of 133 256 acres, 150 581 500 lbs. of tobacco of 12 different kinds, which 149 211 500 lbs. were utilizable. The total cost of purchasing a quantity of tobacco was £ 1 239 407, namely £ 1 212 651 price paid for the tobacco, £ 14 076 for transport and £ 12 679 expenses for delivery, etc.

The returns of the different kinds of tobacco are as follows :

	lbs
Wrappers for cigars	28 334
Tobacco leaves	36 584 000
Szeged tobacco	21 578 000
Debreczen "	62 323 250
Szutok "	2 968 150
Common garden leaves	3 739 900
Fine " "	163 530
Demi-fine " "	7 938 700
Debrő garden tobacco	174 200
Muskatály of Szentandrás variety	401 300
Muskatály tobacco.	94 720
Knaster tobacco	13 217 350

The quantity of foreign tobacco imported in 1912 was 10 821 400 lbs. at £ 642 173.

The Relation between an Abundant Rainfall and the Production of Coffee.
- PESTANA, PAULO R. in *Secretaria da Agricultura, Commercio e Obras Publicas do Estado de São Paulo, Boletim da Directoria de Industria e Commercio*, Series 4, No. 7; pp. 267-272. São Paulo, 1913.

The writer points out a direct, though not exclusive, relation between the rainfall during the months October to March and the yield of coffee in the

(1) See No. 800, B. May 1912; No. 1261, B. Nov. 1913.

Rainfall		Yield of Coffee	
Season	mm.	Year	Arrobas
I - Ribeirão Preto			
1904-05 October-March	1 573	1906-07	3 201 ¹
April-September	270		
1907-08 October-March	905	1909-10	2 487
April-September	196		
1908-09 October-March	896	1910-11	2 310 ¹
April-September	293		
1909-10 October-March	1 209	1911-12	2 540 ¹
April-September	229		
1910-11 October-March	753	1912-13	2 164
April-September	358		
II - S. Carlos do Pinhal			
1904-05 October-March	1 950	1906-07	2 214
April-September	511		
1907-08 October-March	1 595	1909-10	1 601
April-September	321		
1908-09 October-March	2 170	1910-11	1 525
April-September	471		
1909-10 October-March	1 459	1911-12	1 403
April-September	523		
1910-11 October-March	1 061	1912-13	1 235
April-September	390		
III - Botucatu			
1904-05 October-March	1 124	1906-07	1 720
April-September	402		
1907-08 October-March	1 103	1909-10	765
April-September	201		
1908-09 October-March	863	1910-11	493
April-September	211		
1909-10 October-March	971	1911-12	668
April-September	165		
1910-11 October-March	842	1912-13	510
April-September	477		

* It must be noted that the coffee plants still showed the exhausting effects of high yield of 1906-07.

on two years later. The same relationship has already been observed in Java. The figures in the table are those of the three principal producing centres in the State of São Paulo. The grouping of months into two periods corresponds to the climatic conditions of the region and to the biological conditions of the coffee plant. October is the beginning of frequent rains, which reach their maximum in December and diminish towards the end of March. In April begins the dry season during which the coffee is harvested, and this terminates in September. Rains during the hot season favour the flowering the following year and the fruiting of the second year, but during the cold season they are injurious.

The Selection of Tea. — BERNARD, CH. and VAN LEERSUM, P. in *Mededeelingen van het Proefstation voor Thee*, No. XXVI, 15 pp. + 4 plates. Buitenzorg, 1913.

Disinfection and selection. — The writers have just perfected a method of disinfecting the seeds of the tea plant and separating those possessing a low germinative power. The disinfection is accomplished by means of a 1 per thousand solution of corrosive sublimate, and its chief object is to preserve Java from two pests which do not yet exist in the island, which cause damage in British India: *Exobasidium vexans*, which produces blister blight, and the green fly (*Chlorita flavescens*).

The seeds after being taken out of the corrosive sublimate bath are placed into pure water with the object of washing them and separating those that float and which form class (a). The seeds that are heavier in water are then placed in a 25 per cent. solution of sugar: some float and the others sink (c). After the sugar bath also the seeds are washed in pure water.

The (a) seeds have a low germinative power; they are put into a germinator and those which sprout are added to the (b) seeds, which are sown in a nursery; then the most vigorous plants are selected. As for the (c) seeds, the best, they may be sown at once where they are to remain. This method is very rapid, simple and economic, and it has given excellent results.

Grafting. — In order to improve the quality of existing plantations, the writers have devised a method of grafting which gives 70 per cent. of successful grafts, and this with still inexperienced hands. The stock must be between 3 and 5 years of age and the best time for the operation is the beginning of the rainy season. The graft that has yielded the best results is one in which a T-shaped incision is made in the bark of the stock. The graft is a strong shoot bearing three or four buds and somewhat lignified at its base; its lower extremity is cut to a bevel about $1\frac{1}{4}$ inch in length, inserted into the T-shaped incision, the sides of which are then drawn together and the whole is carefully bound.

The question of decorticating the tea seeds used for sowing is not completely settled; it seems, however, that it is preferable to crack the tegument without removing it from the grain.

- 245 - *Suaeda fruticosa* for the Fixation of Shingle Beaches. — OLIVER, P. in *The New Phytologist*, Vol. XII, No. 9-10, pp. 337. London, December 1913.

The writer recommends *Suaeda fruticosa* as the most effective stabiliser of all British shingle plants, in virtue of its shrubby habit of growth and high capacity for rejuvenescence.

- 246 - The Nursery of American Vines in The Tremiti Isles (Adriatic). Its History and the Results obtained. — *Communication from the Italian Ministry of Agriculture, Industry and Commerce.*

The discovery in France of the possibility of protecting vineyards by phylloxera by using American stocks led the Italian Ministry of Agriculture to take up the cultivation and distribution of these stocks.

During several years, many kilograms of seed of American vines were distributed among the institutes and vine-growers, and numerous nurseries and important vineyards of stocks were installed in the various districts of Italy. Seed of typical Riparia was first distributed, and later seed of Rupestris and Berlandieri.

Thus up to 1883 the phylloxera-free regions contained four larger series, which supplied vineyards for the production of Riparia seed, namely one at Rome entrusted to the Royal Practical Agricultural College; one at Parma under the direction of the Royal Agricultural Station; one at Acire directed by the Royal Oenological Station; and the last at Acire under the immediate control of the Agricultural Committee of Acire.

Nurseries and vineyards of Riparia (type), Rupestris and Berlandieri were then instituted, on a smaller scale, at the special schools of viticulture and oenology and the majority of the schools of practical agriculture. Others again were instituted at the above-mentioned schools and other practical schools with rooted cuttings of American stocks already cultivated in Italy, namely York Madeira, Solonis, Violla, Taylor, Opus Clinton, Concord and Jacquez.

These varieties, however, though at first considered the most suitable for the reconstitution of vineyards, soon lost favour with the growers owing to the discovery, during continued and extensive experiments carried out in different districts in France, of new stocks resistant to pest and more suitable from the point of view of cultivation. It then became necessary to provide for their cultivation and distribution.

It was to supply this need that an attempt was made to establish a nursery of American stocks on the island Montecristo (Tuscan Archipelago) with material bought in France and previously disinfected. Unfortunately, this important attempt came to nothing, as only a year after its establishment, phylloxera was observed in a small portion planted with rooted cuttings, and the Ministry of Agriculture, on the advice of the Consultative Antiphylloxera Commission, decided to destroy without delay the vines which had been imported to Montecristo, and which were already growing vigorously.

Further, the vineyards first reconstituted with material obtained from seed immediately showed many drawbacks to the system. As it was to be foreseen, the nurseries of stocks (not excluding Riparia) contained a

of a large number of varieties, of which many were unhealthy and preposed to fungus diseases. As to the more vigorous varieties, their suitability for cultivation and their resistance to phylloxera were not yet known. These disadvantages were to some extent obviated by a vigorous action in all the seed nurseries and by opportune researches on the resistance and suitability for culture of the selected plants.

In order, however, to obtain some information from the above experiments, it was necessary to wait a considerable time, while in some important growing regions in Italy phylloxera was already widely spread and the need of providing for the reconstitution of the lost vineyards was urgently felt. Consequently the Ministry of Agriculture decided not to limit the material available to that supplied from the above mentioned nurseries (in order not to place growers in the infested regions of Italy at a disadvantage as compared with foreigners from the point of view of the reconstitution of their vineyards) but consented to the importation from France, with all the necessary precautions, into the infected regions where they had abandoned the destruction of vineyards by destruction, of American stocks which showed more promise of success than those already in Italy. In this way the series of American stocks already mentioned came to be planted in various regions of Italy, and more particularly in Sicily, Sardinia and Elba, where the insect had caused considerable damage.

In 1900, an attempt was again made, this time in the Tremiti Islands, where the starting of a nursery of American vines has been a complete success.

The task of providing for their installation was entrusted to Leopoldo Danesi, who on two occasions selected the necessary material in France, and took a considerable portion from the Royal nursery of American vines at Portoferraio.

The Island of San Donnino, about 16 miles from the Apulian Coast, was chosen as being the most suitable of the Tremiti Islands for this purpose; it is the largest of them, having an area of 214 acres. Climatic conditions there approach those of the adjacent coast. Rain is infrequent, and drought continues every year from April to September. The winter is mild and the summer rather hot, but rapid changes are frequent at all seasons, and sharp falls of temperature occur when the north wind blows.

The nursery is at Don Michele, where the soil is a calcareous loam, and the subsoil, in places of calcareous tufa and in places of compact limestone, is lying at a depth varying between 20 and 24 inches or even more. Considering its origin, the surface soil is not remarkably rich in calcium carbonate, which reaches 16 per cent. only in some places.

The land was bastard trenched right across to a depth of 2 ft. 6 in. During the first year (1900) the nursery covered an area of $5\frac{3}{4}$ acres; this increased in the following years and now reaches 25 acres.

The vines selected were those species and varieties which had given the best results in the trials so far made in Italy, all being stocks except a single hybrid direct-bearer. Preference was given to those suitable for calcareous lands and the southern regions of Italy, which are liable to prolonged drought.

In 1904 other stocks were added and a large number of direct-bearers favoured by the French growers, so as to have a supply of this material for the cultivation experiments necessary in the different regions of Italy.

The attached table indicates the number of stocks and direct-bearers grown.

	No. of existing plants	Vines grafted for trial of affinity with the stock	Vines for the production of cuttings
Stocks	40 460	1 067	39 393
Direct-bearers	3 033	—	3 033
Total	43 493	1 067	42 426

Only cuttings were used for planting, and they were taken from the vigorous stocks free from fungus disease. They were examined one by one and all showing any lesion or any sign suggesting presence of disease were rejected. All were then disinfected at Portoferraio by immersion for 15 minutes in water at 55° C., the temperature scarcely falling 1° and seldom reaching 51° at the time of extraction.

The cuttings thus treated were immediately packed with all care and despatched to the Tremiti Islands. On arriving at their destination they were immersed in a 1 per cent. copper sulphate solution and then planted with a forked stick, the holes being carefully filled in with a thick paste sand and fine earth. They were planted at a distance of 5 ft. each way.

To ensure the striking of the cuttings of Berlandieri and of certain varieties, they were grafted onto well-rooted cuttings from a locality absolutely free from phylloxera. To obtain a large number of shoots the first year, 2372 Italian plants in the Giovannella vineyard in the neighbourhood of the nursery, in good condition of growth, were grafted with the principal American stocks. The grafts were made low down so that they might root. The layering was next carried out in such a manner that the same distance was left between each plant as between those in the nursery.

For six years from 1910 the plants were rigorously inspected, with negative results. In spite of all precautions taken in the choice of material the first symptoms of "bramble-leaf" (roncetto) appeared during 1903 and some *Riparia Rupestris* and *Rupestris du Lot*; in the following year other plants developed the disease. However, the rapid spread of the disease was checked each year by eradication of the diseased plants and those close to them. Further, in order to effect a rigorous selection, the Ministry of Agriculture sent two specialists in September 1912 to examine with every possible care the entire nursery; they destroyed 223 plants which they considered affected with "bramble-leaf" or suspected. Most of the diseased vines occurred in the Giovannella vineyard where grafts had been made on Italian stocks and then layered. It should be noted that this vineyard is

other heavy soil on a steep slope facing north, and is thus subject to considerable variations of temperature.

The first distribution of material was made in 1903 with shoots from three-year-old vines. It was not until 1904-5 that the whole 25 acres was planted with stock-vines. Since then the production has varied in normal years between a million and a million and a half of cuttings of various sizes. This material has been chiefly distributed among societies for protection against phylloxera, numerous agricultural institutions controlled by the Ministry of Agriculture and where possible to private growers.

The societies have established, with material from the Tremiti Is., nurseries of stock-vines covering an area of over 815 acres, capable of an annual production of about 40 million cuttings of various sizes. They have so planted nearly 215 acres of rooted cuttings and established more than 60 vineyards for experiments and demonstrations.

The other institutes have also established new nurseries and transformed old nurseries by grafting. Perhaps in some places this transformation has been somewhat premature, resulting in the abandoning of certain seedlings produced under conditions very different from those of our vine regions, which might have been more valuable than the ones mentioned; there is now a tendency to take up the study of some of these again.

Besides the establishing of the stock nursery, various other experiments which may be worth describing have been carried out in the Tremiti Islands.

The principal American stocks have been grafted with the better local varieties, such as Trebbiano, Sangiovese, Malvasia, Galoppa and Cay, and a very careful account has been made of the growth of the vines, their production, and the quality of their produce, etc., so as to gain practical knowledge of their bearing with the stocks in question.

Every year hybrids have been made among the different American varieties and between them and the above-mentioned Italian ones. Selection of the seedlings was made in the seed-bed and those which showed by their morphological characters that they were not hybrids, were rejected. The selected seedlings were then sent to the experimental vineyards of S. Giovanni and S. Michele in the province of Bari, where their resistance to phylloxera is being tried. Some plants already give hopeful results.

The fruit and musts obtained from the direct bearers have been analysed each year, and also the products from the grafted vines, to determine the influence of the stocks on the quantity and quality of the product. Results of some importance have been obtained, and will be published shortly.

Numerous experiments have been made on the disinfection of vines to test their resistance to hot water. Dr. Danesi has given an account of these experiments and other experiments made elsewhere in various papers, some of which were published in the *Atti dell'Accademia dei Lincei*.

Thus we may conclude that the nurseries of American stocks in the Tremiti Islands have supplied a veritable need of Italian viticulture and have completely attained the object for which they were established.

- 247 - **The Composition of Irrigated and Non-Irrigated Fruits** (1). JONES, J. M. and COLVER, C. W. in *Idaho Agricultural Experiment Station, Bulletin No. 75*, pp. 1-23. Moscow, Idaho, August 1912.

It is a generally widespread belief that irrigated fruits are more liable to decay and possess less flavour than non-irrigated fruits. Since this inferiority is attributed to abnormally high percentages of water and correspondingly low percentages of solid matter, analyses were made of the content of dry matter, sugar, acid and crude protein in various fruits grown under these two systems, with a view to testing the truth of these suppositions. It was not presumed, however, that chemical analyses alone could settle questions relating to quality in fruits.

The material used in these analyses was not obtained from specially controlled plots; all irrigated samples were grown in districts where climate and soil render irrigation imperative, all non-irrigated samples in districts where the annual rainfall varies from 25 to 35 inches and where the soil and topography of the country render irrigation methods impracticable. The comparisons are therefore made between *normal* irrigated and normal non-irrigated fruits.

In the case of drupaceous fruits, analysis shows distinct differences in favour of non-irrigated fruits, especially when the results are calculated on the dry matter; but they are not considered sufficiently large to seriously affect the taste, except in the case of Italian and Petite prunes.

In the case of apples, the non-irrigated almost invariably contain greater percentages of acid and sugar, but the differences are small and practically disappear when calculated on the total dry matter. Irrigated apples contain a smaller percentage of solids insoluble in water, but intensity and uniformity of colour, and in percentage of waste, they have somewhat the advantage over the non-irrigated.

Of the small fruits, strawberries alone show any marked difference in composition due to irrigation. When irrigated they are decidedly inferior in dry matter, sugar, acid and crude protein, and they lose their freshness and keeping qualities much earlier. In the case of blackberries and raspberries, irrigation results in an increased percentage of sugar and decreased percentage of acid when calculated on the total dry matter, and is therefore a distinct advantage in growing these fruits for marketing in the desiccated condition.

In general, it may be said that no marked differences in food or market value of fruits can be attributed to the effects of irrigation.

- 248 - **The Pollination of the Coconut.** — PETCH, T. in *The Tropical Agriculturist*, Vol. XLI, No. 6, pp. 449-455 + 2 figs. Peradeniya, Ceylon, December 1913.

The coconut tree is monoecious and the flower dioecious; a period from 2 to 5 days elapses between the shedding of the last male flower and the opening of the first female flower. Pollination can therefore only be effected by pollen from other inflorescences of the same tree, when the flowering periods overlap, or from the male flowers of neighbouring trees.

(1) See No. 1348, B. Dec. 1912.

is the duration and frequency of the flowering periods is of the utmost importance in determining the degree of fertility of the tree.

From an examination of the structure of the female flower, the writer concludes that pollination is generally effected by bees and hornets and, to a large extent by the wind. Though ants are abundant on the inflorescences, their access to the stigma is prevented by the exudation of a sticky juice from a large number of pores situated on the exposed surface below the stigma.

Observations made during 1912-13 on the opening and shedding of flowers showed that, to ensure overlapping, the interval between successive flowering periods should not exceed 30 days, thus necessitating the production of 12 or more inflorescences per annum. The intervals varied between 15 and 58 days, being longest at the beginning of the year and shortest at May and June.

Observations on the shedding of immature nuts gave inconsistent results. Overlapping of the flowering periods was not followed by an increase in the number of nuts retained. Further experiments are necessary to determine the relation of this phenomenon to fertilisation.

- **The Flowering of Pears.** — CHITTENDEN, F. G. in *The Journal of the Royal Horticultural Society*, Vol. XXXIX, Part 2, pp. 366-372. London, December 1913.

The writer gives a list of varieties of pear trees under observation at Wisley, arranged in relative order of flowering, and showing what varieties may be expected to be in flower at about the same time each year.

- **The Cultivation of Teak in Java.** — SCHAEFFER, G. in *Journal d'Agriculture Tropicale*, Year 13, No. 150, pp. 353-356. Paris, December 1913.

Java possesses at present upwards of 1 480 000 acres of teak forests, and this splendid asset increases every year, as the area reafforested is two and a half times larger than the area felled during the same time; on the other hand teak is nowhere cultivated except in Java. In the island the conditions required for the cultivation to be profitable are a fair soil of at least medium fertility, a minimum of 60 cm. (40 in.) of yearly rainfall and an altitude inferior to 100 m. (330 feet).

Regeneration. — Teak sends up numerous shoots from the stool, but the trees thus obtained being much inferior to seedlings, this mode of regeneration is not utilized. The seeds are sown in holes in rows at 3 ft. by 10 ft. Other crops, such as rice or earthnuts, are grown between the rows during the first year.

Maintenance. — The greatest attention of the forester is devoted to preventing alang-grass (*Imperata arundinacea*) from invading the plantation; hoeing being too expensive, *Leucena glauca*, a leguminous plant, is sown between the rows as a cover plant; it chokes the alang and keeps the soil moist; besides which it prevents the leaching out of the soil and enriches it with humus and nitrogen and disappears when the cover of the forest is sufficient.

Felling. — The new artificial forests are still too young to be felled; it is estimated that the trees will attain a diameter of 24 inches at the age of 80 or 100 years.

LIVE STOCK AND BREEDING.

251 - New Investigations into the Life History of the Two Warble Flies of Cattle (1). — GLASER, HANS, in *Mitteilungen des Ausschusses zur Bekämpfung der Dasselplage*, Part 5, pp. 5-38. Berlin, 1913.

The writer reports upon the continuation of his investigations into the life history of the two warble flies of cattle, undertaken for the Committee for the Control of Warble Flies. Altogether 314 warble flies were here from 375 mature larvae that had spontaneously left their warbles; of these 208 were the large *Hypoderma bovis* and 106 the smaller *H. lineata*. In this connection it was found that the issuing of the larvae took place early in the morning and in by far the greatest number of cases while the host animals were standing or walking and only exceptionally while they were lying down; it begins mostly half or three-quarters of an hour after the animal stands up, and is interrupted if the animal lies down again. The writer explains this fact by the difference in the tension of the skin of the cattle.

On the same animal larvae of the large and of the small warble fly may be found. On issuing from the hide they are easily distinguished. The larvae of *H. lineata* are smaller and more slender than those of *H. bovis*, and when mature they are gray brown, while those of the larger fly are greenish brown. The colour is a sure test; even when small and slender larvae of the larger fly are found. In general the larvae of the small fly are somewhat earlier than the others.

The change into pupa takes place on warm and dry days mostly within 24 hours; in rainy and cold weather the process lasts 2 to 4 days. The larvae of *H. lineata* always require less time for the change than those of *H. bovis*. The pupal stage of the small fly averages 30 days, that is 14 days less than that of the larger fly. In general the males have a shorter pupal stage than the females; thus the latter, on issuing from the pupa, always find sufficient males with which to mate.

The emergence of the flies takes place in the early morning and with preference on fine sunny days; this explains their appearing in large numbers when the weather is fine. The swarming of *Hypoderma lineata* is the most part in June, that of *H. bovis* in July.

The deposition of eggs takes place most frequently immediately after mating. Both the small and the large fly generally lay their eggs on the legs, and by preference on the hind legs a little below the hock. Besides this, the writer saw the flies frequently depositing their eggs on the body of a calf used for experiment. Occasionally a fly would settle on the flanks or breast. No fecundated female ever deposited eggs on the head of the calf. The animal always became very excited on the approach of a female fly, whence the writer concludes that during June and July, perhaps August, the gadding of cattle is due to warble flies. The

(1) See No. 144, B. Feb. 1913.

uses its eggs to adhere to the hair of the host and the writer observed that the large warble fly sticks only one egg per hair, while the small fly sticks several of them on one hair, as many as 15 having been counted.

The egg of *H. bovis* is larger and more slender and more pointed at the free end than that of *H. lineata*. Further, the stalk which joins the egg of the large fly to the extension that embraces the hair is thinner than in the eggs of the smaller fly. The habit of the small warble fly of laying several eggs on one hair explains the fact that during oviposition it fastens itself more firmly to the hair than the other fly; it holds its ovipositor nearly parallel to the hide of the animal, while *H. bovis* sinks it most vertically into the hair. The number of eggs that one fly can lay under favourable circumstances was determined by the writer for one *H. lineata*: it amounted to 550.

In the eggs very spiny maggots or bots develop after a few days; they issue from the eggs on to the hide of the animal: the writer assumes that the cattle take up the larvae rather than the eggs.

The writer has also conducted experiments in order to ascertain if the larvae of the two warble flies are able to penetrate into the skin of man and of animals. The result has always been negative as regards cattle, but in man, in one case (on the writer himself), a larva penetrated the skin of the thigh.

Last year for the first time infection experiments could be carried out on six cattle with fecundated eggs and larvae. The results, however, will not be determined till the spring. The writer hopes soon to be able to report upon the most suitable methods of controlling this pest.

2 - **The Natural Infection of Calves with Tubercle Bacilli.** — CHAUSSEÉ in *Comptes-Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 157, No. 16, pp. 642-644. Paris, October 20, 1913.

The writer submitted to careful examination 56 calves destined for the slaughterhouse and suffering from typical tuberculosis, with the object of ascertaining the principal way by which the tubercle bacillus had entered their bodies. Of the 56 animals, 44 had typical tubercles in the lungs, while all the other organs, including those of digestion, were intact. The infection then must have followed the respiratory canal. Material from the intestinal glands of 11 animals was inoculated into guinea-pigs and produced tuberculosis only in one case. But in this case also it was not certain that the corresponding calf, besides lung tuberculosis, had not testicular tuberculosis also.

Of the remaining 12 calves, 8 showed decided tuberculosis of the liver and its glands. In these cases, the infection must have taken place before birth, which seems all the more probable as the stage of the disease was much more advanced than in the pulmonary tuberculous calves. The four st calves had severe intestinal tuberculosis and had tubercles in the walls of the intestine and in the mesenteric glands. The tubercle bacillus in these calves had undoubtedly been introduced with their food. In all the calves the glands of the infected organs were much degenerated. The

animals infected before birth showed a more advanced degeneration than those infected by the air or food.

The writer concludes from these investigations that the animal organism has always the tendency to oppose a local reaction as soon as possible to any local infection with tubercle bacilli. Consequently the development of the disease proceeds somewhat more rapidly in the calf than in mature cattle. Calves take the tubercle bacillus in the great majority of cases from the air. Nevertheless, infection before birth is not unimportant. Infection by means of the food is much rarer than through the air. In France the writer found in 6000 slaughtered calves only one that had been infected by its food. The reason of this may partly lie in the fact that the herds of cows are relatively only very slightly affected by tuberculosis. In pigs, this kind of infection is naturally much more frequent, owing to their very varied food. In 169 pigs that were slaughtered the writer found one animal that had taken the bacillus with its food.

It can therefore be assumed that cows' milk is only in the rare cases the cause of human tuberculosis.

253 - **Piroplasmosis of Cattle in Hungary.** — FABRICI, JÁNOS in *Állatorvosi Lapok*, Year XXXVII, No. 4, pp. 37-38. Budapest, January 24, 1914.

The writer gives a description of *Piroplasma bovis*, which makes its appearance in some regions of Hungary, especially in the mountainous parts of the county of Máramaros, where it is so virulent as to cause even more trouble than anthrax, with which it is easily confused. In the mountainous districts the disease appears at the beginning of the warm days in spring, generally in the month of May, when the cattle grazing on bushy pastures are attacked by hundreds of ticks, vehicles of the disease.

Piroplasmosis may become chronic, and even contagious. According to M. Hustyra, director of the Royal Veterinary College of Budapest, it is curable. Considering its ravages from an economic point of view, the writer recommends a minute investigation being made.

254 - **Scab and its Cause, with Special Consideration of Chamois Scab.** — BIGER, J. in *Zeitschrift für Infektionskrankheiten, parasitäre Krankheiten und Krankheiten der Haustiere*, Vol. III, Part 6, pp. 341-365. Berlin, November 28, 1913.

The writer describes, with the aid of illustrations, chamois scab, its morphology and physiology of the mite that causes it, and discusses the results of his recent experiments on the transmission of chamois scab to three goats and a sheep. The most important results are the following:

1. Goats can be artificially infected with chamois scab and in infected goats the disease can spread spontaneously to other goats. From this it may be inferred that the natural transmission of scab from chamois to goats is possible.

2. Sheep also, though with much greater difficulty than goats, can be artificially infected with chamois scab. A spontaneous transmission of chamois scab to sheep seems, however, unlikely.

3. Transmitted scab in goats has the tendency to heal by itself.

th of hair proceeds with extraordinary rapidity. The healing process is
ed in by a falling off of the scabs.

4. The disease begins by the skin becoming horny, which symptom
minates throughout; atrophy, inflammation and hyperplasia set in.

5. The scab mites of many animals do not excavate passages in the
rmis in the direction followed by the sarcoptes mite of man, but they
vertically or in an inclined direction though all the epithelial layers
finally reach the hypodermis.

**The Udder as an Emunctory: Elimination of Artificial Colouring Matter
by the Udder.**—FORCHER, CH. in *Revue générale du Lait*, Vol. 9, No. 18, pp. 409-419.
Paris, November 30, 1913.

In the first experiment the writer introduced by means of an esophageal
into the stomach of a goat 0.5 gram of uranin; neither the milk
the urine of the goat nor the urine of her kid showed later any trace
of uranin. Then 1 gram of uranin was injected into a vein of the neck
of the same goat, but no proof of the presence of uranin was detected either
in the urine of the goat or kid or in the milk or in the digestion product
of casein. The same result was obtained with 3 grams of uranin intro-
duced into the stomach of the goat.

In a second experiment the writer introduced into the stomach of a
goat 2 grams of rhodamin. After an hour she yielded a rose-coloured milk;
three hours the rose colour was much weaker and the following day
it disappeared. Submitted to dialysis, the milk allowed the rhoda-
mine to pass through the membrane. On coagulating the milk with acetic
acid a rose-coloured casein was obtained, the colour of which disappeared
on the further addition of acid. The urine of the two kids was slightly
coloured, that of the mother highly coloured. In comparison with the
quantity given, the amount that passed into the milk was very small. The
rhodamin contained in the milk was completely eliminated in the urine of
the kids.

In a third experiment a goat was given 1 gram of methylene blue (Hy-
drochloride). Her urine and excrements were coloured a deep blue and
contained leuco-derivates; but her milk and the urine of the kid showed
traces of blue colouration. Another goat had 3 grams of methylene
blue injected into a vein with the result of a slight coloration of the milk
and a very slight colour in the urine of the kid. The day after the injection
the milk had recovered its normal colour. The quantity of methylene
blue that had passed into the milk was at most one three-hundredth part
of the quantity administered.

In a fourth experiment 3 grams of crystallized ponceau were introdu-
ced into the stomach of a goat. Neither the goat's milk nor the kid's urine
showed traces of ponceau.

Lastly in a fifth experiment the writer gave a bitch and three goats
dimethylamino-azobenzol. The bitch had 1 gram by way of the stomach,
one hour later the milk, on the addition of hydrochloric acid, was in-
tensely rose-coloured. The puppy also excreted the colouring matter with
its urine. Goat No. 1 had 1 gram of dimethylamino-azobenzol introduced

into her stomach, but did not eliminate the colouring matter either in milk or in the urine. Only the next day, when she was given another of the same substance, could its presence in the milk be detected, and a few hours later the milk had recovered its usual colour. Goat No. 2 was also given 1 gram of the colouring matter without its appearing in the milk or the urine. Goat No. 3 was given 5 grams of dimethylamino-azobenzene and only after some hours did her milk become deep blue. On distilling it, it was found that by far the largest portion of the colouring matter dissolved in the fat of the milk.

The writer draws from these observations the conclusion that the colouring matters are not eliminated from the udder by only one of the components of milk. In order to leave the udder, some colouring matters dissolve in the whey, others attach themselves to the casein, and others again dissolve, immediately on entering the udder, in the fat globules of the milk. This latter process, according to the writer, is the one to which all colouring matters having a basic reaction are subject, fat being a solvent for them.

It can therefore be assumed that the intense coloration of milk observed in summer from cows grazing where yellow flowers are abundant is due to the plant components possessing a basic reaction.

It has further resulted from the experiments that the milk glands do not easily allow the passage of colouring matter and seem to exert a very close selection on all molecules brought by the blood, some being accepted and others as strictly as possible rejected. The writer believes, therefore, that the composition of the food and that of the milk are not so closely connected with each other as is commonly believed.

256 - The Effect of Sugar on the Digestion of Nitrogen. — GOMY, and ANDOUARD, P. in *Comptes-Rendus Hebdomadaires des Séances de l'Académie des Sciences*, Vol. 75, No. 36, pp. 550-552. Paris, December 19, 1913.

The writers, in continuation of a previous experiment, carried out a feeding experiment on a growing pig in order to test the effect of sugar on the utilization of nitrogen. The animal was fed daily, during the first period, 500 grams of earthnut cake, 70 grams of degelatinized barley and manioc roots *ad lib.* In the successive period the rations were the same, except that Jerusalem artichokes were given *ad lib.* instead of manioc roots. Each period lasted 42 days and during both the periods carried out investigations on the foodstuffs given and utilized. The increase of weight was, during the starch (manioc) period, 667 grams, and during the sugar (Jerusalem artichoke) period 595 grams. The starch was always completely utilized, while the sugar of the artichokes was often only incompletely taken up. During the latter period the animal ejected in its excrements considerable quantities of undigested food. At the same time a typical effect of the sugar on the digestion of nitrogen was noticeable, namely that in consequence of a less intense digestive activity the quantity of nitrogen transformed into gas in the excrements was diminished. While this loss, during the starch period, amounted to 9.38 per cent. of the nitrogen in the food, during the sugar period

only 0.07 per cent. In previous experiments with a heifer calf the corresponding losses were, in the starch period 20.10 per cent., and in the sugar 15.86 per cent., while with a steer the losses were respectively 26.77 and 4.08 per cent. It appeared further that when feeding sugar a more scant excretion of nitrogen in the droppings took place. During the starch period the pig excreted an average of 25.93 per cent. of the nitrogen in the food and during the sugar period 48.73 per cent. In a previous experiment with a heifer calf the corresponding values were respectively 39.43, and with a steer 35.33 against 56.34 per cent. This experiment thus confirms the observations made previously by Rother on a growing steer, that sugar diminishes the utilization of starch and the loss of nitrogen by fermentation in the alimentary canal.

The Organic Phosphoric Acid of Cottonseed Meal. — ANDERSON, R. J. — *New York Agricultural Experiment Station, Technical Bulletin*, No. 25, pp. 1-12. Geneva, N. Y., December 1912.

An acid has been isolated from cottonseed meal which decomposes into phosphoric acid and inositol when heated with sulphuric acid and is in every way similar to phytic acid. When fed in doses of 0.5 and 1 gm. to rats, symptoms of distress were observed which passed off in a few hours.

Cattle-Feeding Experiments. — BRUCE, W. — *Edinburgh and East of Scotland College of Agriculture, Report XXXI*, 1913.

During the season 1912-13 the experiments of 1911-12 (see Report XXII) were continued and a comparison was made between the feeding of linseed cake, of wheat bran, and of a complex mixture consisting of:

Uncorticated cotton cake	2 parts
Decorticated " " " " " " " " " " " "	1 "
Linseed cake	1 "
Bran	3 "
Maize meal.	1 "

compounded so as to contain approximately the same amount of food material as would be present in an equal weight of linseed cake.

Three lots of cattle consisting of 16 individuals each were fed with the three materials. The trials were carried on for 19 weeks and the average results during that time were:

Lot I	3.95 lbs. linseed cake, 3.78 und. cotton cake	} 10.2 lbs. swedes
Lot II	5 lbs. bran " " " " " "	
Lot III	7.73 lbs. complex mixture	} 7.78 " oat straw

The three lots made practically the same increase, the average daily gain being just over 2 lbs. per head, and no differences were observed in the final condition of the cattle of the different lots which could be attributed to the feeding. Linseed cake at £ 8. 16. 3 per ton and wheat bran at £ 5. 8. 9 per ton the extra cost of Lot I cost £ 5. 16. 3 more than that of Lot II, after value of the manurial residues have been deducted.

- 259 - **A Study of the Udder Flora of Cows.** — HARDING, H. A. and WILSON, J.
— *New York Agricultural Experiment Station, Technical Bulletin* No. 27, pp. 1
Geneva, N. Y., March 1913.

1230 samples of milk derived from 78 cows were examined bacteriologically. Separate samples were drawn from each quarter of the udder and showed that the germ content can vary considerably in the different quarters of the same udder, the back quarters usually having a far higher germ content than the front ones. Neither the age of the cow nor the period of lactation appeared to exert any marked influence on the germ content of the milk. The number of organisms per cc. varied from 0 to 156 with an average of 428. They were classified into 71 groups and were characterised by lack of motility, of spore formation, and of gas formation consisting largely of micrococci and being practically all Gram positive.

- 260 - **Carcase Tests conducted on Lincoln and Mangalica Pigs in Hungary.**
— WELLMANN, O. in *Köstelek*, Year 23, No. 97, pp. 3272-3275. Budapest, December 13, 1913.

It is well known that the most esteemed breed of pigs in Hungary is the curly-coated Mangalica pig (1), which owes its popularity to its high yield in fat and its suitability to the conditions of the country. With the growing intensity of agriculture in Hungary, it becomes more desirable to improve this breed from the point of view of prolificacy and early maturity.

The English Lincoln Curly-coated breed resembles the Mangalica in many points, but is more prolific and earlier maturing; consequently it seems the most suitable for the improvement of the latter breed.

With this object in view, crosses between Lincolns and Mangalicas have been practised since 1910. In order to ascertain how far the Lincoln pigs answer to the requirements of the Hungarian breed, the National Agricultural Association of Hungary (Országos Magyar Gazdasági Egyesület) entrusted a committee with the carrying out of carcass tests in the principal slaughterhouse of Budapest on fattened Lincoln and Mangalica pigs and on crosses between the two breeds. The description of the pigs examined upon and the carcass results are shown in Table I.

These data show that among pigs fattened for five months on barley and maize groats the dead-weight of Lincoln × Mangalica pigs is the same as that of the pure-bred Mangalicas at 26 months. The dead-weight of all the animals amounted to 82 to 88 per cent. of live-weight.

(1) See No. 559, B. May 1913.

TABLE I.

Eggs slaughtered	Age	Live weight		Blood		Bristles		Offal		Internal fat		Dead weight	
	Months	lbs	%	lbs	%	lbs	%	lbs	%	lbs	%	lbs	%
do X Mangalitzá	28	730	100	14	1.9	10	1.4	72	9.8	28	3.9	629	86.1
galiczá	50	535	100	10	1.8	10	1.9	44	8.2	18	3.5	471	88.4
do	42	847	100	—	—	—	—	—	—	—	—	713	84.2
galiczá	26	420	100	—	—	—	—	—	—	—	—	365	87.0
do	"	469	100	—	—	—	—	—	—	—	—	385	82.2
do X Mangalitzá	14	453	100	—	—	—	—	—	—	—	—	385	85.0
do	"	495	100	—	—	—	—	—	—	—	—	431	87.1

Bacteriology of the Hen's Egg with Special Reference to its Freedom from Microbic Invasion.—RETTGER, LEO F. in *Centralblatt für Bakteriologie, Parasitenkunde und Infektionskrankheiten*, Vol. 39, No. 23-25, pp. 611-624. Jena, January 6, 1914.

In the course of the extended investigations of bacillary white diarrhea of chicks, which has been carried on at the Storrs Agricultural Experiment Station for the past three years, bacteriological examinations have been made of more than ten thousand eggs. Many of the eggs were examined when fresh, while others had been incubated from one to three weeks. Most of the eggs came from the College and Station stock; others were received from different parts of the country.

For the investigations only clean and normal-looking eggs were used. Before testing the eggs agar cultures were made from the yolk and the white, the direct and the indirect methods being followed. The writer also conducted a series of fermentation experiments in order to determine the presence of organisms of the *Bacillus coli* type.

Table I shows the number of eggs examined and the numbers of bacteria found in them.

Bacterium pullorum, the specific organism of white diarrhoea, is not a part of the bacteriological content of the eggs, as all the eggs infected with it come from ovaries in a pathological condition. Excluding this, it is interesting to note that eggs which have been incubated from one to three weeks contain very few bacteria. But the yolks of fresh eggs show a low bacterial content. Among the incubated eggs, those which had been incubated one week contained considerably more bacteria than those which had been incubated two weeks. The reason of this is not clear, as the temperature of incubation was the same in the two cases. It is, of course, true that the first-test eggs are to a large extent infertile; but they also include some which, although they have been fertilized, have failed

State of eggs when tested.	Number of eggs tested	Number of infected eggs	Number containing <i>B. pullorum</i>	Per cent infected eggs not including <i>B. pullorum</i>
Fresh eggs	3 510	500	169	9.5
Incubated one week	1 746	68	20	2.75
Incubated two weeks	2 167	56	28	1.3
Incubated three weeks	1 984	179	108	3.6
Fresh eggs: whites, 5 cc. quantities . . .	582	7	0	1.2
» » yolks, 10 cc. quantities . . .	647	36	11	3.4

to undergo embryonic development. According to these facts, for eggs appear less liable to bacterial invasion than infertile ones, which contrary to general opinion. It is probable that some of the fertile eggs which failed to develop contained bacteria which prevented or arrested early development.

That the relative number of eggs which harbour bacteria other than *B. pullorum* is greater for those which have been incubated three weeks than for the seven and fourteen day eggs is to be expected.

The percentage of positive results obtained with the whites is undoubtedly higher than the actual facts warrant. It must be said, however, that these investigations were made in the height of summer, that is at a time when considerable difficulty was experienced in obtaining aseptic conditions. It is therefore probably safe to say that the whites of fresh normal eggs are as a rule sterile.

In the fermentation tests, which were made to determine the presence in the whites of the gas-forming bacteria, 105 eggs were examined and results were all negative.

The microorganisms found in the yolks of fresh and incubated eggs from healthy ovaries, arranged according to the number of times found, are given in the following summary:

FRESH EGGS.

Staphylococcus usually *aureus* and *albus*.
Subtilis group » *B. mesentericus* and
B. ramosus.
B. coli and closely related organisms,
Proteus group.
Streptococcus.
Micrococcus (*tetragenus*, etc.).
Streptothrix.
Diphtheroid bacillus.
Putrefactive anaerobes.
B. fluorescens.
Mould.
B. mucosus.

INCUBATED EGGS.

Staphylococcus usually *aureus* and *albus*.
B. coli and closely related organisms.
Subtilis group, usually *B. mesentericus*.
Proteus group.
B. pyocyaneus.
Streptococcus.
Streptothrix.
Mould.
B. fluorescens.
Diphtheroid.
B. mucosus.

The writer compares these results with the data given by other investigators, especially Lamson, Poppe, Stiles, Bates, Zörkendörfer and Koswicz, and then gives the following summary and conclusions:

1. The contents of normal fresh eggs are, as a rule, sterile. It is quite probable that an egg yolk may become invaded before it is expelled from the ovary; but this is apparently an uncommon occurrence except when the ovary is infected with the organism of bacillary white diarrhoea.
2. Little if any infection takes place in the oviduct while the white of the shell are being deposited, on account of the protective action of the mucous lining and also the bactericidal action of the egg white itself.
3. Even eggs that have been incubated artificially for three weeks remain relatively free from bacterial decomposition, providing they were fresh and clean when placed in the incubator.
4. Under normal conditions the shell is bacterium-proof. Moisture renders its impervious character, however, and when combined with dirt, makes it possible for micro-organisms to enter. Increased temperature then hastens the decomposition.
5. Eggs should be gathered from the nests soon after they are laid; the nests must be kept in a sanitary condition to prevent soiling of the eggs.
6. When they are to be preserved for any length of time only clean eggs could be selected; unless they are placed in preserving fluids, eggs must be kept dry.
7. There is no evidence to indicate that fertilized eggs spoil more readily than the unfertilized, as they do not contain more bacteria than the latter.

FARM ENGINEERING.

Bansome's Steam Traction Engines. — MANRIN, in *Bulletin de la Société pour l'Industrie Nationale*, Year 112, Vol. 120, No. 3, pp. 483-485. Paris, November 1913.

The writer describes these traction engines, which have two speeds, $\frac{1}{2}$ and 3 miles per hour. They are built in five sizes.

The first four traction engines have one cylinder, the last is a compound. Their normal performance is respectively 5, 6, 7, 8 and 10 H P. Besides their usual work as traction engines for agricultural tillage implements, they may be used as common portable engines.

The Electromotor and the Small Farm. — STRAUSS, W. in *Dinglers polytechnisches Journal*, Year 95, Vol. 329, Parts 1 and 2, pp. 4-7 and 20-23. Berlin, January 1 and 10, 1914.

While about fifteen years ago it was currently believed that electricity was especially suitable for large farms, now, on all sides, it is seen that it is especially the medium and the small farmer who can use electricity very advantageously. In this paper the writer points out the great profits that small farms derive from the use of electric power, and comes to the conclusion that it renders possible an increase of the gross returns,

a diminution, though small, of working expenses, and, what is of great importance to the farmer, the substitution of mechanical power in the place of labourers and teams. A further beneficial effect of the use of electricity is a further development of the spirit of cooperation.

264 - **Agricultural Motors for the West Indies.** — *The Implement and Machinery Review*, Vol. 39, No. 466, p. 1363. London, February 1, 1914.

According to a report of the Canadian Trade Commissioner in Barbados, the Imperial Department of Agriculture and the local agricultural associations in the British West Indies afford assistance to firms importing machinery and implements. In Ste. Croix in consequence of experiments previously made by the Danish authorities, agricultural motors have been imported and work successfully. The Canadian Trade Commissioner further reports that in St. Kitts, St. Lucia, Montserrat and Antigua the soil is deep and loamy and consequently suitable to mechanical tilling. In Barbados, on the contrary, with the exception of small areas, the soil is not suitable.

265 - **The Work of the Windlasses, of the Cables and of the Pulleys in Mechanical Ploughing Outfits.** — RINGELMANN, M. in *Bulletin de la Société d'Encouragement pour l'Industrie Nationale*, Year 112, Vol. 120, No. 3, pp. 465-468. Paris, November 1913.

In the few experiments hitherto made with steam ploughing windlasses and cable outfits, the observations were limited to a determination of the work of the cylinder by means of an indicator and to a comparison of this with the work done by the ploughing implement. With internal combustion motors the consumption of fuel was compared with the performance of the ploughing implement. Such determinations, however, from the technical point of view are insufficient, and M. Ringelmann in connection with the trials at Plessis, in which Howard's system of cable tackle round the field was used, calculates in this paper on the one hand the amount of energy required by the windlass, under the various conditions of position and length of the cable as well as the position and number of the guide and corner pulleys, and on the other hand the energy transmitted to the tilling implement situated at the other end of the cable.

The writer gives a summary at the end of his paper, with data on the percentage distribution of the total energy transmitted from the motor to the windlass.

Energy required	{	for the windlass	3.4	}	24.9
		» » corner pulleys.	15.5		
		» » cable.	4.2		
		» » various losses.	1.8		
Energy given up at the extremity of the cable.	{	Energy required by plough	61.0	}	75.1
		Energy for paying out the cable	14.1		
		Total energy supplied by the motor	100.0		

The following is the distribution of the energy required by the cable:

Energy required	{ for the cable	4.2	30.1
	{ for the corner pulleys . .	2.8	19.6
	{ for the windlass drum . .	7.1	50.3
Energy transmitted by the plough . . .		<u>14.1</u>	<u>100.0</u>

These data facilitate in a simple manner the determination of the consumption of energy for any system of mechanical tillage.

Trial of Motor Ploughs. — *Mitteilungen der Deutschen Landwirtschafts-Gesellschaft*, Year 28, Part 42, p. 580, Berlin, October 18, 1913. — *Deutsche Landwirtschaftliche Presse*, Year 41, No. 2, pp. 16-17, Berlin, January 7, 1914.

From the official report of the trial of motor ploughs which took place Klein Wanzleben from August 21 to 23, 1913, the following verdicts are given:

1. *Motor plough of Friederich Kuers (Tegel).* — The two-engine system steam ploughing has the advantage of great steadiness of work, but the advantage that the tackle is cumbersome to move about and that heavy tlay is required on the plant in comparison to the work done. This system ther lends itself only to a limited extend to other work besides ploughing. The traction engines are solidly built and reliable and in consequence of a low number of revolutions are probable durable. During the main trial the performance was limited in quantity; during the trial of resistance it was gher; the quality of the work was good.

2. *I. H. C. 30 to 60 H. P. motor with eight-furrow plough of the German International Harvester Company Ltd., (Berlin).* — The tractor system is easier move about and is suitable for mowing and many other agricultural erations besides ploughing. On slippery or very loose soil there is the danger coming to a standstill through the wheels skidding. The number of volutions of the motor is moderate and its probable durability is good. Its rformance was very good, both as regards quantity as well as quality.

3. *Caterpillar motor tractor with tilling and transport implements belonging it, presented by the general agent of the Holt Caterpillar Company (Budapest).* The Caterpillar system presents the advantage of great traction power and nesequently it is relatively very reliable; on the other hand its installa-on is expensive and it is somewhat cumbersome to move about. The trac-on engine is complicated and, it is anticipated, will be very liable to wear it. Its performance was very good, as to both quality and quantity.

4. *Universal 45 to 50 H. P. motor plough, of the Universal Motorpflug-gesellschaft m. b. H. (Munich).* — The machine presented the advantages and advantages of the tractor system. Its construction led to numerous in-ruptions of work. Its performance was very good as to quality, but low to quantity and the consumption of fuel was high.

5. *Pöhl's Patent motor plough, of Gustav Pöhl Maschinen und Motor-fabrik, g. m. b. H. (Gössnitz, Sachsen-Altenburg).* — Pöhl endeavoured

to apply the tractor system to small farms. The machines did not show satisfactory reliability.

6. *Stock motor plough, of the Stock Motorpflug-Gesellschaft m. b. H. (Berlin).* — Stock represents the first machine built on the motor-car plough system, which offers the advantage of combining low total weight and correspondingly low cost of installation. Its reliability on soft soils is greater than with the tractors, with the exception of the Caterpillar. The construction is good, but the number of revolutions of the motor is high and its probable duration is limited. Its performance was sufficient as regards quality and good as to quantity.

7. *Power plough on Wendeler Dohrns' system of the Deutschen Kraftpflug-Gesellschaft m. b. H. (Berlin).* The motor plough is a handy and solid development of the motor-car plough. Its performance was good in quality and quantity.

8. *"Acra" motor plough of the "Kyffhäuserhütte" Aktien-Maschinenfabrik.* — This machine is intended as a development of the motor-car plough system for the heaviest work. It will, however, attain this object only after certain improvements in its construction.

267 — **Trial of a Double-Furrow Turn-Wrest Plough with Lever Adjustment.** — FUCHNER, H. in *Mitteilungen des Verbandes landwirtschaftl. Maschinen-Prüfungs-Anstalten*, Year 7, Part 5, pp. 182-185. Berlin, 1913.

In the introduction to his paper, the writer gives an illustration of this plough and describes it. It differs from similar machines in that the depth and breadth of the furrow can be regulated whilst the plough is working.

One of these ploughs was tried on the Royal estate of Weißenstephan and proved useful and easy to handle. The lever adjustment used while working was recognized as a distinct advantage.

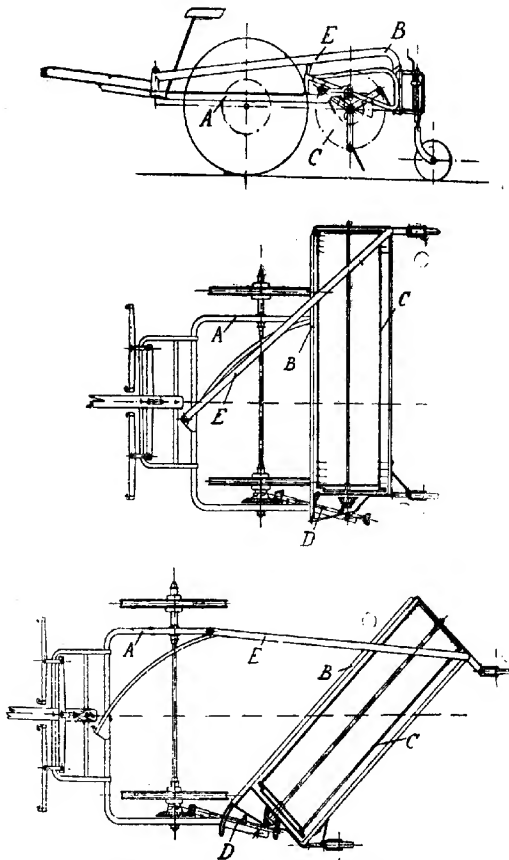
Determinations of the traction power it requires showed that 308 to 396 lbs. are sufficient in loamy soils. The plough can consequently be drawn by two average horses without excessive fatigue. It can be adjusted to depths varying from 1 ½ to 7 inches, and to a maximum breadth of 11 inches. It weighs about 370 lbs. and is most suitable for medium soils. The price of the plough with coulter and reserve share is £6 11s 4d.

268 — **Trial of a Combined Hay Tedder and Side-delivery Rake.** (42nd Report of the Machine-testing Bureau of the Chamber of Agriculture for the Province of Brandenburg). — FISCHER, G. in *Mitteilungen des Verbandes landwirtschaftl. Maschinen-Prüfungs-Anstalten*, Year 7, Part 6, pp. 229-234. Berlin, 1913.

This machine was used during the whole hay season of 1913 on the Gutenpaaren estate. It consists of a frame, A, on wheels, connected with another frame, B, carrying a revolving rake or tedder, C. The position of the tedder can be shifted by moving the frame that carries it round a vertical pivot. When at right angles to the direction in which the machine is drawn it acts as a tedder, when shifted round to an angle of 45° with its former position it acts as a side-delivery rake. The figures show the machine in both positions. The rake is driven by conical gearing on the axle of the front

wheels, and on an intermediate shaft, *D*. The change in the position of the rake is effected by removing a pin in the head of the connecting draught rod, *E*, and turning this round to its new position.

The writer describes the experiments that were made with the machine and gives its most important dimensions and the speeds at which the several parts work. In conclusion, he states that the combined tedder and side-delivery rake worked very well on extensive areas through the whole season without any interruption. It worked satisfactorily also when turning round.



Combined hay tedder and side-delivery rake.

269 - **Theory of the Drum for Threshing Machines.** (Trial of agricultural machines at the Moscow Agricultural Institute). — GORJATCHEV, W. in *Mitteilungen des Verbandes landwirtschaftl. Maschinen-Prüfungs-Anstalten*, Year 7, Part 5, pp. 184-215, Berlin, 1913.

This paper, which throws light from a purely mechanical point of view on some of the more difficult problems connected with agricultural machines, is intended for specialists in the construction of threshing machines.

The writer deduces the fundamental formula for the work of the drum of the threshing machine, examines it and gives several diagrams of velocities. In order to prove the connection between the motor and the work of the drum, besides these experiments made in 1910 and 1911 a whole series of complementary experiments should be carried out, namely:

1. On the friction of the axles at various numbers of revolutions.
2. On the resistance of the air at various numbers of revolutions.
3. On the slipping of the belts when running empty or with load.
4. On the performance of the motor at various numbers of revolutions.
5. On the effective acceleration of the drum at various numbers of revolutions, and the power of the motor, that is the curve of the increase of velocity when running empty.

270 - **Average Results of Threshing Experiments.** — HAGENSTEIN in *Maschinen Zeitung*, Year 12, No. 1, pp. 8-9, January 1, 1914.

The writer gives the results which he obtained by some experiments on threshing cereals, in which feeding the sheaves headfirst (Langdrusch) was compared with feeding them sideways (Kopfdrusch). The sheaves were made by a Deering six-foot binder, and thrashed by a good Flöther threshing machine provided with baler and automatic binder.

Barley. - Headfirst feeding. — In one hour 156 sheaves weighing 31 lbs each were threshed; the loss of grain was 192 grams per sheaf, or 660 lbs in 10 hours. Performance per hour, 3527 lbs., weight of straw about 4925 lbs.

Sideways feeding. — In one hour 210 sheaves weighing 31 lbs. each were threshed. The loss was 80 grams per sheaf, or 370 lbs. in 10 hours. The quantity of barley threshed per hour was 4960 lbs., the weight of the straw 6482 lbs.

With this output from headfirst feeding the loss would be 928 lbs. an excess of 558 lbs. over the sideways feeding.

Mixture of one-third barley and two-thirds oats. - Sideways feeding. — In one hour 225 sheaves weighing 27.6 lbs. each were threshed. The loss per sheaf was 33 grams of grain, or in 10 hours 163 lbs. The total threshed was 5126 lbs., the weight of straw being about 6200 lbs.

Headfirst feeding. — In one hour 186 sheaves weighing 27.6 lbs. each were threshed; they yielded 3803 lbs of mixed grain. The loss per sheaf was 56 grams of grain, or in 10 hours 229 lbs. Weight of straw about 4921 lbs.

Thus the extra loss on headfirst feeding on the quantity threshed in ten hours by sideways feeding was 146 lbs.

— **Milk Separator "Göricke R. N. E. 1."**, (8th Report of the Agricultural Machine and Implement Testing Station at Tábor, Bohemia). — CERNY, I. in *Mitteilungen des Verbandes landwirtschaftl.-Maschinen-Prüfungs-Anstalten*, Year 7, Part 5, pp. 177-182. Berlin, 1913.

This milk separator is intended to be worked by hand and for the treatment of about 33 gallons per hour. Its total weight is about 70 lbs. The writer gives a minute description of the machine and of its working, and then reports upon the results obtained at the trials. These were carried out between July 31 and August 24. The chemical investigations were conducted in the laboratory of Prof. R. Truka at the Royal Bohemian Agricultural Academy at Tábor.

The paper contains tables of the data collected during the trials, some of which were made with the milk at 35° C. (95° F.), others at 30° C. (86° F.) and at 25° C. (77° F.) The number of revolutions per minute varied from 70, normal, to 60.

The verdict of the judges was that the separator removes the cream well, its running is smooth and easy and its presumable durability is high.

1. — **Centrifugal Milk Filter "Albissa"**. — *Deutsche Schlacht- und Viehhof-Zeitung*, Year 13, No. 52, pp. 799-800. Berlin, December 28, 1913.

This centrifugal filter is a machine for cleaning milk; it unites the advantages of centrifugation with those of a cotton filter. It is very cheap, requires but little time and power and is also highly recommendable from a hygienic point of view.

The machine consists of a support and the drum proper. The latter is a first strainer in which the coarser impurities are separated out. The drum itself consists of an inner perforated head, round which cotton wool is fixed and then stretched and firmly kept in its position by an equally perforated frame. This machine, worked by hand, can easily pass 220 gallons of milk per hour through a single cotton filter; driven by power it can treat much as 1100 gallons in the same time, purifying the milk mechanically in the most complete manner.

— **Revolving Churn with Frame.** — *Deutsche Landwirtschaftliche Presse*, Year 41, No. 4, p. 45. Berlin, January 14, 1914.

The novelty in this churn consists in the pivots round which it revolves being no longer attached to the vessel itself but to a frame in which the churn is placed. The advantages of the machine are the facility with which the vessel can be removed and handled and the easier and smoother running.

The churn is made in different sizes to hold from 15 to 44 gallons, and the price ranges from £ 4 8s to £ 6 12s 4d.

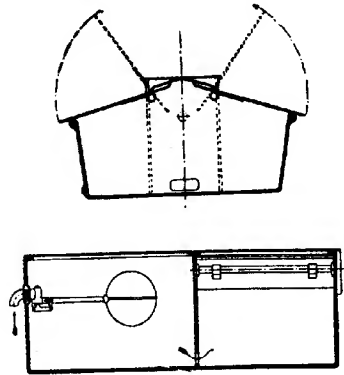
— **Potato Drying as Auxiliary Industry for Distilleries.** — DEGEL, R. in *Deutsche Landwirtschaftliche Presse*, Year 40, No. 93, p. 1104. Berlin, November 19, 1913.

The writer gives an estimate of the working expenses of potato-drying works of various output, attached to distilleries. The great difference in cost of drying in such works as compared with that of independent drying works, is chiefly due to the fact that in the former part of the distillery it can be used, the manager of the distillery can look after the drying, only one or two extra men are required.

275 - **Automatic Drinking Trough.** — *Deutsche Landwirtschaftliche Presse*, Year No. 2, p. 17. Berlin, January 7, 1914.

This drinking trough, of which a front view and section are given, has been declared by the German Agricultural Association (*Deutsche Landwirtschafts-Gesellschaft*) as "new and worthy of consideration".

It is intended especially for pigs and young stock. It consists of a central reservoir with float and two drinking troughs, one on each side of the reservoir. In order to allow the troughs to be easily opened and not less closed, the covers are provided with counter weights. The main water pipe communicates with the reservoir by means of a small bore pipe; water passes from the reservoir into the trough by an aperture in the side between the two. When the animals drink out of the trough and the level of the water sinks in it, the float opens a tap which allows fresh water from the main pipe to flow into the reservoir until the proper level is again reached. The advantages the apparatus presents are that it automatically supplies the animals with the required quantity of fresh pure water, that it is easily and cheaply put up, that all its parts are accessible, and that it is effectually protected against dirt of any kind. Its price is about \$1.10.



Automatic Drinking Trough.

RURAL ECONOMICS.

276 - **The Significance of the Fluctuations in the Price of Cereals for the Ability of the Moravian Peasant Farms.** — *OSTERMAYER, ADOLF* in *Österreichische Agrar-Zeitung*, Year IV, No. 50, pp. 559-602; No. 51, pp. 611-614; pp. 625-627. Vienna, December 13, 20 and 27, 1913.

The writer states that the prices of cereals between 1906 and 1907 went a permanent rise, due for the most part to the increase of the customs duty. He examines the effect of the fluctuations in the prices of cereals.

	per cent.	Average cereal duty	Net returns per acre	Net returns in percentage of capital in farm.
1902	6 11/4		21 8 1/4	
1903	7 2 3/4		20 7 1/4	
1904	7 0 3/4		22 4 1/4	
1905	7 2 1/4	1 1 1/2	22 0	
1906	6 11 1/2		21 10 3/4	
1907	8 1 1/2		23 10	
1908	8 10 1/2		25 1 1/2	
1909	9 6 1/4	2 7	25 10	
1910	8 4 1/4		23 10 1/2	
1911	9 1 1/4		25 6 1/4	

3 per cent and less.

3.25 to 3.5 per cent.

TABLE II.

Period	Average extent of farm acres	Value per acre £ s d	Net returns		Compens. for work		Total Income		Interest on debts		From net returns of debts calculated per cent.	Thus less than formerly
			per acre s d	in per cent. of capital	per acre s d	in per cent. of capital	per acre s d	in per cent. of capital	per acre s d	in per cent. of capital		
Before	25.06	44 1 11	12 8	1.43	47 5	5.38	60 1	6.81			65.7	—
After			15 6	1.75	47 5	5.38	62 11	7.13	8 8	0.94	53.7	12.0
Before	47.35	35 18 2	18 6	2.57	25 4	3.52	43 9	6.09			32.2	—
After			21 10	3.04	25 4	3.52	47 2	6.56	6 0	0.83	24.0	8.2
Before	130.84	28 18 6	16 5	2.84	15 6	2.68	32 0	5.52			21.4	—
After			20 3	3.50	15 6	2.68	35 10	6.18	3 7	0.61	17.4	4.0

between the years 1902 and 1911 on the average net returns of 60 Morav peasant farms. Assuming these farms to send to market an average only 44.1 per cent. of the cereals they produce, the receipts from the sale of cereals would average only 16.9 per cent. of the total receipts of the farms, yet the increase in the price which took place after 1906 increases considerably the profitability of the farms, for the rate of interest of the capital invested in them, which up to the year 1906 had been only about 3 per cent., rises above this figure, up to 3.5 per cent.

If the 60 farms be divided according to their altitude into three groups and then the effect of the increase of the price of cereals upon the profitability of these groups of farms be examined, it will be found that the rate of interest in the years 1902-06 averaged for the farms situated in the plains about 3 per cent., for the farms situated in the mountains about 1.12 per cent., and for those in an intermediate position about 2.25 per cent.; while for the years 1907-11 the corresponding rates of interest were 3.5, 1.75, and 3 per cent.

In order to ascertain whether the increase of prices was important for the small farms, as well as for the large and medium ones, the writer divides the 60 farms into three groups according to their extent and calculates for each their net returns, the rate of interest on the capital invested in them, the compensation to the members of the owner's family for intellectual and manual labour, as well as their resulting income for two five-year periods — one before the effect of the increased duty and after, that is before and after 1907. He examines further the effect of the increase of the net returns upon the indebtedness of the farms. The results are collected in Table II.

The smaller the farm the greater is the part taken by the compensation of labour out of the total income and the smaller the rate of interest on capital. The increased rate of interest due to the increased duty and consequently higher prices of cereals grows with the extent of the farm; nevertheless the slight increase observed in the smallest farms acquires greater importance for the conservation of the property, when it is considered in consequence of the improvement that set in in 1907 of the ratio between net returns and interest on debts, the latter claims 12 per cent. of the net returns, less than formerly, while in the other two groups of farms this benefit amounts to 4 per cent. respectively. In the paper all these results are given in tables and diagrams.

277 — **The Amortization of the Capital in Buildings in Swiss Agriculture**
TANNER, CARL in *Archiv für exakte Wirtschaftsforschung*, Vol. 5, Parts 3 and 4, pp. 583. Jena, 1913.

The writer first defines the problem and then states the opinions of the subject current in agricultural literature. He is opposed to the theory of the fund for a new building and that of the paying off of the cost, and is in favour of the simple depreciation theory (according to Laur). Consequently he does not approve of compound interest being used in the calculation of the quota of amortization. This must not, however, depend upon the price and requirements of the accountant, but must be based on firm

es founded on the real depreciation of the building due to wear and tear to the effect of economic factors (technical progress, change in the id of the farm).

With this object in view, it is advisable to decompose the value of buildings into separate groups, the wear and tear of which follows the or similar laws. The amortizable parts of the building (in opposi- to those that are not to be amortized, namely the site and the value he materials after demolition) are best divided into two groups, one rprising those parts which last the whole time over which amortiza- extends, and the other those that have to be renewed once or ner during the time that the building will last. This latter group can ill further subdivided. The quota of amortization of each group is ined by dividing its original value by the duration of the correspond- group. The amortization quota of the whole building is then the sum he quotas of each group. The more extensive repairs (renovation or eep repairs) are to be booked as a supplementary value of the corres- ponding group and amortized like the other parts of the building.

The gradual depreciation of a building caused by technical progress y the change in the trend of the farm can best be united to the amor- ment due to wear and tear by shortening the probable duration of the ip of parts that lasts the whole time of the building. This group is only one really affected by the above depreciation, and shortening the tion correspondingly increases the amortization quota.

The amortization is given in percentages of the original value.

The writer deals then more specially with conditions obtaining in Swit- land in respect of agricultural buildings. By means of question sheets

	Calculated on the basis of extensive subdivision of the capital in buildings into groups	Calculated on the basis of subdivision of the capital in buildings into permanent and renewable parts
	percentage	percentage
inghouse of the Fricktaler type (North-west Switzerland)	1.25	1.31
" the Berne type	1.47	1.50
" the Freiamt type	1.40	1.38
" the Lucerne type	1.33	1.46
utbuildings and stable of the Fricktaler house . .	2.22	2.23
" " of the Berne house	2.59	2.59
" " of the Freiamt "	2.19	2.62
" " of the Lucerne "	2.39	2.56
outbuildings of the transition type of 1880 .	2.52	2.43
outbuildings, built after 1905	2.47	2.50
e dairy: Dwelling house	1.55	—
ork rooms and cellarage	2.14	—

addressed to farmers, country builders, carpenters and architects, he ascertained the duration of agricultural buildings and their parts and used these data to calculate the amortization percentages. Further, with the aid of the valuations of buildings made by the fire insurance institute of the canton Aargau, and considering the various types of Swiss buildings, he calculated first the percentage of the various groups in the total capital invested in buildings and then their quota of amortization expressed in percentage of the original value. The addition of the amortization quotas of the separate groups gives for the whole buildings the amortization percentages of the original value, including the amortization of periodically recurring repairs (see Table. p. 395).

The contents of the question sheet, the answers obtained, as well as the separate and average results of the calculations, are shown in tables.

278 - **Proposals for Reform of the Valuation System based on the Inherent Capacity of the Soil ("Bonitierungstaxe").** — AEREBOR, F. and BRENNEMANN, J.

— Teil II der Vorschläge zur Reform der Taxprinzipien des Kur- und Neumärkischen Ritterschaftlichen und des Neuen Brandenburgischen Kreditinstitutes, pp. 1-53. Berlin, 1904.

In the first, or theoretical, part of their work, the writers begin by treating the following fundamental question: whether it be well to keep to the present method of valuing land, which consists of a "scheme of valuation based on returns" ("schematisierte Ertragstaxe"), or whether it would not be advisable to substitute for it a capital valuation which does not attempt to determine the total and mortgage values of an estate by the round-about method of calculating the gross returns and working expenses and from them the capitalised net returns, but values directly the kind and amount of capital involved in the estate.

To discuss the question, the actual meaning of "the capitalised value of an agricultural estate" ("Ertragswert eines Landguts") must be clearly defined. It is usually defined as the capitalised value of the mean returns over a number of years. But even leaving aside the fact that, owing to the large annual fluctuations of the net returns, the number of years taken will exercise a considerable influence on the mean value of the net returns and therefore on the final result, *i. e.* on the amount of the capital determined, the capitalised value of agricultural estates, like the value of any other source of return in national economy, can only be expressed in terms of future return while past returns can only serve to predict *probable* future returns. The capitalised value is therefore only the expression of a future capacity of returns, that is a purely estimated value, obtained not by a single estimate but by a general estimate in the scheme of national economy, and may also be obtained by capitalising all the common values of all future returns from agricultural estates. Therefore the capitalised value and the common value of agricultural estates should be equal.

It follows that equal net returns would not always yield equal capitalised values. In practice there are always a number of factors which cause the money value of equal returns to correspond to a variety of capitalised values which may differ considerably amongst themselves. Such factors are, for example, the different conditions

credit and taxation in the various countries, for the important point is not the sum total of the net returns, but simply that part of the net returns which the agriculturist receives as rent for his land under identical conditions. Another still more important factor in this connection is the manner in which the purchasing power of a given income from an estate will vary according to the position of the estate, for an estate is not only a means of earning a definite sum of money, but also the place of residence of the agriculturist.

It may be concluded that the net returns as defined by Thayer and Von Goltz cannot be utilized directly for the valuation of estates, that there is not at present and never has been a capitalised value obtained from net returns capitalised at a fixed rate.

But all the above factors are automatically taken into consideration in settling the market price of an estate. The writers show how these prices will vary with the returns, future possibilities being considered not only by the purchaser but also by the seller, as the prices only constitute a statement of the minimum returns to be obtained for a certainty by the purchaser. The market price is therefore the only reliable means of estimating the value of an estate, and should always serve as the basis of valuation, whether the question be one of credit, succession, expropriation or taxation. Net values are merely a statement of prices, and any valuation established without regard for prices may be set down at once as deprived of a valid sense. Therefore all so-called valuations based on returns are of no scientific practical value.

Over and above the impracticability of the process of valuation recommended by text books on the subject and known as the "detailed valuation based on returns" ("ausführliches Ertragstaxverfahren"), such a valuation could never give reliable results, even if unlimited time could be spent on the work and unlimited knowledge were brought to bear on the subject, because of the inaccuracy of the gross returns estimates, and because of the impossibility of determining exactly the rate at which the net returns are capitalised. The fact that many credit societies have worked successfully for some long time using the scheme of valuation based on returns may be readily explained, as these valuations are not really "valuations based on the returns" ("Ertragstaxen") but capital valuations (Kapitaltaxen) determined on the basis of returns calculated from the interest of the market price, and for which, therefore, the point of departure is a capital value and the end point is the same capital value attained from nominal gross returns, working expenses and net returns, which are then capitalised.

But in such a system of valuation based on returns there is no clarification as to which part of the total value of the estate constitutes its mortgage value, while on the other hand the capital valuation enables the limit of security ("Kreditwürdigkeit") of each farm to be determined exactly, for the principal task of the capital valuation is to determine reliably and accurately the value of the land as apart from the total farming capital. Then it is only necessary to add to this value the mortgage value

of the buildings, in order to obtain the total mortgage value and the total limit of security of the estate. Besides, the capital valuation is more exact and better adapted to changes of circumstances than is the valuation based on returns.

Payment of rent in cash is a quite unsuitable basis for a systematic valuation of scientific value, for, owing to the variation of the mutual obligations between landlord and tenant, its value is too changeable to form an accurate basis for the estimation of the farmer's capital and much less for the estimation of the total value of the estate.

In the second part of their proposals, the writers outline a scheme of valuation ("Taxrahmen") for the systematic capital valuation, and discuss the manner in which different farms are to be entered according to this scheme.

From the above discussion it will be obvious that it is necessary in the first place to have an accurate knowledge of present prices and of their future development, if a scheme of valuation is to be established which includes the value of all classes of cultivated soil within the working area of each credit institute, classed according to the crops carried and to the quality of the land. The writers make use of the data on prices, which the Prussian Ministry of Finance began to collect in 1889, to establish a mean value for the farms in the different parts of a single credit institute area, classed according to their size and according to the net returns, which served as a basis of assessment for the land tax.

These data only indicate that portion of the price of estates to be attributed to the bare soil, taking no account of the different crops on the estates, and must therefore be further detailed in order to define that portion of the price due to each particular crop; for, as the proportion of the different crops varies largely from one estate to another, and the standard quality of the different crops also vary, the exact value of agricultural estates cannot be established by means of the systematic capital valuation. On a scale of valuation is established in the first place for the various kinds of crops: *viz.* arable fields, meadows and pastures, and also for forests and freshwater fisheries when required, and, in the second place, for different qualities of land under these different crops.

Such special values may be established on the following basis: 1) that estates with high quality soil usually have little meadowland, and therefore that the soil on such estates furnishes a pure value for arable soil; 2) that it is just on the best soils that both arable fields and meadows are equally well adapted to give the best results, and that therefore the value of the best arable fields also represents a maximum value for meadows, and the same scale of values may consequently be used for both. Pastures may also be treated like arable fields if their soil is of such a quality that they can equally well be turned into arable land, and therefore the values of pastures and arable fields only differ by the cost of turning a pasture into arable land. This cost is negligible in comparison to the value of high quality land; consequently, the value of the best pastures is approximately equal to that

best arable land, while poor pastures are worth considerably less than poor ble soil.

In order to allow for the great differences in the economic conditions which exist in the different regions of a large credit institute area, the whole is divided into regions in which different economic conditions prevail, and supplements are added where optimum conditions exist in the subdivisions. These supplements are calculated from the difference of value between the best and worst economic conditions and may amount to 70 per cent. of this difference at a maximum, while they should never be under 10 per cent. of the smaller value itself, increasing inversely with the quality of the land and directly with the size of the farm.

It is also necessary to add supplements where specially good conditions prevail in the case of meadows, but these are much smaller when valuation is based on the quality of the land ("Bonitierungstaxe") than when it is based on the net returns which serve as a basis of assessment for the land ("Grundsteuerreinertragstaxe").

As to the standard by which the land is allotted to the different classes in the scheme, the writers not only allow for the composition of arable land as judged by their principal constituents, but also for their suitability for principal crops. Arable soils are divided into eight classes, each having a different money value. Meadows are also divided into eight classes chiefly according to their water supply and to the quantity and quality of their hay. Forest soils are divided into five classes, chiefly according to their suitability for certain forest species and to the character of their underwood, the latter character being also a good indication of the condition of their water supply. In establishing this scale of values for forest soils, the writers have not, however, made use of the market price of the estates, but of the price which they would fetch if sold to the forest administration. The freshwater fisheries are divided in the first place into natural waters, which cannot be dried, and artificial lakes which can; the latter are again subdivided into three classes according to the ease with which the water supply can be controlled and to the nature of the land, while the natural waters are subdivided into three classes according to the quality of their fishing.

As to the allocation of the estates in the different economic zones, it is convenient to separate the agricultural area (arable fields, meadows, pastures) from the forest area, and both from the area of freshwater fisheries, dividing each group into four zones. In subdividing the agricultural area into its four constituent zones, the distance from the market, the means of communication, and the price of agricultural produce, more especially that of fresh milk sold off the farm, are used. In subclassifying the forest area into its constituent zones, the price of the wood is of chief importance, position and the condition of the forest roads being of minor importance.

For unfavourable conditions which cannot be taken into account in various classes and zones, such as occur, for instance, when crops are mixed instead of being continuous, or when fields of one farm are mixed with those of another farm, when the supply of drinking water is not

good, etc., suitable deductions may be made from the established mortgage value of the land; these deductions must not exceed certain limits which are defined by regulations. Deductions from the amount of credit to be granted should also be made for a faulty economic condition of the farm, for by this means the number of forced sales would be reduced, and it would also prevent the mortgages on such incompletely equipped estates from exceeding two-thirds of the value estimated by the "Landschaft" (agricultural credit association), a proceeding which is contrary to the laws and statutes of those credit institutes.

The mortgage value of buildings is best estimated from the values fixed by fire insurance societies and from the normal relationship between the value of the living-house and that of the farm buildings on the one hand and the normal relationship between the value of all the buildings and that of the land on the other. These normal relationships may be altered by the addition of supplements in cases where industrial plant or numerous cottages in a good state of repair exist on the estate.

279 - **An Example of Agricultural Book-keeping on the Card System.** - *CH. CH.* in *Journal d'Agriculture pratique*, Year 78, Vol. 1, No. 1, pp. 13-16, Paris, January 1, 1914.

The writer discusses the advantages of this system, which can be used with all the usual systems of agricultural book-keeping, and which consists in writing on separate cards all the events of the farm, commercial transactions, single accounts, etc. With the aid of an actual example, he illustrates the entries on the cards and the method of using them.

AGRICULTURAL INDUSTRIES.

280 - **The Condition of the Dairy Industry in the Argentine Republic in 1912** - Communication from EMILIO LABITTE, of the Ministry of Agriculture of the Argentine Republic, Bureau of Statistics and Rural Economy.

A simple comparison of every series of statistical data on the dairy industry in the Argentine Republic during the year 1912 with those of the preceding year shows that the normal condition of live stock during 1912 was accompanied by good results as regards production, and much superior to that of 1911. The figures are shown in the table.

Raw material. - Of the 68 ½ million gallons of milk in the industrial province of Buenos Aires supplied 71 per cent. During the year in question the prices per gallon varied from 2.8 *d* in December to 7.1 *d* in January (prices at the farm). Considering an average price of 3.8 *d* per gallon, the total value of the raw material amounted to £1 089 000.

Cream. - As is to be expected, the province of Buenos Aires is the greatest contributor under this head: 23 112 000 lbs. out of a total of 37 455 000 lbs. (61 per cent. of the whole). The relatively short distances from the federal capital, the easy means of communication and the presence of important centres of consumption, explain the great number of cow farms

	1911	1912	Increase in 1912 over 1911 per cent.
<i>Production of:</i>			
Butter lbs.	26 605 000	37 455 500	40.8
Cheese "	17 427 000	21 818 500	25.2
Condensed milk "	7 305 000	12 416 000	60.2
Stilton cheese "	?	110 000	—
Other "	?	11 590 000	—
<i>Consumption of:</i>			
At dairies	1 160	1 259	8.5
At home	398	523	31.9
At hotels	10	16	60.0
At restaurants	158	129	22.5
At public houses	329	369	12.2

as in the province of Buenos Aires; in the province itself, however, the sales are mainly in the southern and western districts within about 200 miles of the capital.

Butter.—The four great butter manufactories established in the capital produced out 13 586 500 lbs., that is 62 per cent. of the whole output of the country. The average sale prices at the works varied considerably according to the season, as is shown by the following data:

1912	s d
Price of butter per lb. in:	
January, February and March	1 0
April	1 0 1/4
May	1 1
June and July	1 7
August	1 3 3/4
September	1 0
October	11 1/2
November	10 1/4
December	9 1/2

As the prices between April and August may be considered exceptional on account of the drought, which to a great extent diminished the production, a price of 1s 1 1/4 d is taken as an average for the whole of the year.

The total value of the butter is thus £1 207 000.

Cheese.—In this item the increase of the quantity produced in 1912 over that of 1911 is considerable (12 416 300 lbs. against 7 745 900 in 1911). The provinces of Buenos Aires and Cordoba contributed largely to this increase, especially the latter, in which the yield rose from 758 568 lbs. in 1911 to 1 412 276 lbs. in 1912. The price at the dairies may be valued at

5 $\frac{3}{4}$ d per lb., which would give the value of the cheese produced in 1912 as £294 400.

It would be difficult to state exactly the type of cheese that is produced. Nevertheless it may be said that, excepting such cheeses as Tafi, Chebut and the like, there is no commercial type, and in general only very successful imitations of all known kinds are manufactured. Still the figures which will be given below show that these imitations do not prevent considerable importations and that the Argentine consumers prefer the original cheeses of certain determined countries. In fact the imports of all cheeses during the five years 1908-12 amounted to 49 200 000 lbs., worth £1 767 590. In 1912 the imports were 11 849 000 lbs., worth £425 667. As for the countries whence the cheese is exported, Italy has an undoubted supremacy, having supplied 79.3 per cent. of the total in 1912; next follow Switzerland, Holland, France.

Casein. — In view of the increasing importance of the production of this substance, the statistics have minutely investigated its output. The production of 11 590 000 lbs. shows to what an extent the industry has availed itself of skimmed milk in order to meet the steady demand for this substance, which has successfully replaced other industrial products, and which, owing to the prices it commands on the market, yields a fair profit to the producers.

The province of Buenos Aires is the chief producer of casein. Out of a total of 11 590 000 lbs., it has supplied 5 214 500 lbs., or 45 per cent. It is followed by the Federal capital with 4 189 000 lbs. and Santa Fé with 1 573 250 lbs. The following table, which shows the quantities exported from Argentina during the last five years, gives an idea of the future that is for this industry :

	lbs.	Value
1908.	8 461 300	£35 860
1909.	6 117 100	48 350
1910.	6 553 600	51 800
1911.	4 780 300	37 780
1912.	7 717 100	60 990

According to commercial information, the value of this substance in the works may be estimated at £138 600, or £26 10s per ton.

Whey. — On the answers received to an enquiry, 75 per cent. state that whey is used in the feeding of pigs, that is in the production of pork. It is not easy to determine the value of the whey thus transformed, notwithstanding the fact that the quantities used for this purpose are known; there is no doubt that it runs up to some thousands of pounds.

Summarizing, the values for 1912 work out as follows :

Value of the butter	£1 207 000
" " " cheese	294 500
" " " casein	138 500
" (calculated) of the other products and by-products	23 000
Total value of the produce of the dairy industry	£1 663 000

The Decomposition of Milk Proteins by Lactic Ferments.—DE GRAAFF, W. C. and SCHAAF, A. in *Annales des Falsifications*, Year 6, No. 62, pp. 639-645. Paris, December 1913.

In working out a new method for the quantitative determination of the proteins in milk the writers ascertained that the aldehyde index of buttermilk averages 1.5 times greater than that of fresh milk. The cause of this assumed to be a decomposition of the protein in the buttermilk. Recent investigations made in this direction have confirmed this assumption, shown that fresh milk never contains albumoses and peptone, which are always found in buttermilk. In order to ascertain through what agency protein was decomposed, the writers investigated the effect of rennet and of lactic acid upon the aldehyde index of milk. It appeared that even after 24 hours rennet has no effect upon the aldehyde index; nor did lactic acid, alone or combined with rennet, have any. It can therefore be assumed that decomposition of protein is not accomplished by rennet or by lactic acid but by the micro-organisms in the milk.

The writers consequently studied the growth of the microflora, both with the exclusion and with the admittance of air; then they treated fresh milk with buttermilk and finally they isolated lactic acid bacteria (cocci and bacilli) from buttermilk and introduced them into sterile milk. The result was that both in the presence and absence of air nearly the same milk was developed, from which the conclusion to be drawn was that it consisted mainly of lactic acid bacteria. The addition of buttermilk to fresh milk was regularly followed by an increase of the aldehyde index of the latter.

The inoculation with lactic acid bacteria isolated from buttermilk resulted after a short time a decomposition of protein in sterile milk.

From the above observations the writers draw the following conclusions:

1. The aldehyde index of buttermilk is higher than that of fresh milk, and this is to be attributed to a decomposition of the protein in buttermilk by lactic acid bacteria (principally cocci and bacilli).

2. Besides lactic acid bacteria, milk contains other proteolytic bacteria, but these are in too small numbers to alter the aldehyde index.

Composition of Ewes' Milk Butter.—MARTIN, M. in *Annales des Falsifications*, Year 6, No. 62, pp. 662-663. Paris, December 1913.

The writer communicates the results of analyses of ewes' milk butter prepared in the district authorized laboratory at Rodez (Aveyron, France). The fresh milk was supplied by an inspector of the dairies of the "Société des Laitiers et Producteurs réunis" of Roquefort. It came from the flocks of farmers whose respectability was a guarantee of the purity of the milk. The samples were obtained from two of the farms each week, so that the same milks returned to the laboratory once every fortnight.

Ewes' milk butter is generally very white, soft and difficult to work to dry. Its defective appearance banishes it from the table, in spite of its fine taste. It is not rare, however, to find it mixed in various proportions with cows' milk butter on the markets of the Roquefort cheese district. It is very suitable for cooking and for pastry.

Its chemical composition is very nearly the same as that prepared from cows' milk, but the content of insoluble volatile acids and saponification value are decidedly higher. There are nevertheless considerable variations. It is certainly impossible to characterize by means of these data alone a mixture of cows' milk and ewes' milk butters, and still less to determine the proportion of each. The following table shows the figures found by the writer in ewes' milk butter.

	Volatile acids					Total soluble acids		Values		Deviation of densitometer refractive index
	soluble *	Insoluble	ratio $\frac{i}{s} \times 100$	solubility (Reichert)	Insoluble in Na OH 10	Na OH in cc.	in butyric acid, percent.	saponification	Cramer	
Average	5.26	0.84	15.6	28.48	4.40	23.6	12.5	231.58	54.86	-29 1.430
Maxima	5.88	1.07	19.7	31.82	7.01	27.9	14.73	242.60	59.99	-24.5 1.434
Minima	4.67	0.67	11.5	25.65	2.53	21.6	11.4	216.31	47.09	-33 1.431

* The figures of the first three columns were found by Munz-Coudon's method and those of the other columns by the official method.

283 - **Composition and Properties of Some Casein and Paracasein Compounds and their Relations to Cheese.** - VAN SLYKE, L., and BOSWORTH, A. W. *New York Agricultural Experiment Station, Technical Bulletin No. 26*, pp. 1-34, Ithaca, N. Y., December 1912.

Two new compounds of casein and paracasein (casein precipitated by rennet) with calcium have been prepared and are described. The new compounds contain smaller amounts of base than any other known compounds, and the writer suggests their being called "mono" and "di-basic caseinates" or "paracaseinates". Mono- and di-basic salts of barium and strontium were also prepared and mono-basic salts of ammonium, sodium and potassium.

The paracaseinates contain twice as much base as the caseinates as the valency of the latter appears to be 8, while that of the former is only 4, which seems to suggest that the action of the rennet enzyme is to split the casein molecule into two.

A protein formed in the process of manufacture of Cheddar and other cheeses and soluble in a 5 per cent. salt solution is identified with mono-calcium paracaseinate.

284 - **The Amount of Bone in Animals for the Slaughterhouse.** - TARDON, L. *L'Hygiène de la Viande et du Lait*, Year 8, No. 1, pp. 18-22, Paris, January 10, 1913.

The proportion of bone (that is the ratio of the weight of the bones to the total weight of flesh and bones) in animals taken to the slaughterhouse is very variable; the weight of bone reaches and sometimes exceeds one third of the total weight of the animal. In full-grown cattle, which has

most studied from this point of view, the percentage of bone varies with the breed.

The writer has made investigations on calves and sheep in order to ascertain whether there was any connection between the weight of bone and the age, quality and weight of the animals.

I. *Influence of age.* — An examination of the carcasses of nine calves which had been seized in the Paris market because too young, showed that the percentages of bone varied from 29.6 to 33.4, while in other somewhat older calves the lowest proportions found were 20.6 and 21.9 per cent, a difference between the extreme cases of 12.8 per cent.

With sheep, a first series of observations bore on 12 animals which had been seized for their cachexy and leanness. The extreme percentages of bone were 30.4 and 26.9, the average for six lambs and a young ewe being 34.2 and that for five older sheep 29.6. In a second series of observations on animals of good quality, one lamb was found which yielded 25 per cent. of bone, whilst two older ewes and one ram gave respectively 15.2, 16.7, and 18.4 per cent., or an average of 16.75 per cent.

In calves and sheep it thus appears that the proportion of bone is higher in the younger animals.

II. *Influence of quality.* — As for calves, various weighings have yielded the following results :

	Percentages	
	Extremes	Average
9 young calves of very poor quality	29.1 — 33.4	31.8
3 calves of poor quality	26.8 — 29.6	28.25
3 " of 2nd and 3rd. quality	24.3 — 27.7	26.1
3 " 1st class quality	20.6 — 26.2	22.9

In mutton the proportions of bone were :

	Percentages	
	Extremes	Average
6 lean and cachectic lambs	30.4 — 36.1	33.9
6 " " " wethers and ewes	26.9 — 36.4	30.75
1 lamb, 2nd quality		24.25
4 wethers or ewes, 1st quality	15.2 — 22.3	18.15

It thus appears that in calves and sheep the quantity of bone varies inversely with the quality of the animals.

III. *Influence of the weight of the animals.* — The weights recorded in the preceding experiments afford information as to the connection between the quantity of bone and the total weight of the animals. The results yielded the following results.

	Percentages	
	Extremes	Average
6 calves weighing less than 44 lbs.	30.6 — 33.4	32.5
3 " " from 44 to 66 lbs.	29.6 — 32.2	30.5
6 " " " 66 to 132 "	24.3 — 29.6	27.2
3 " " upwards of 132 lbs.	20.6 — 21.9	22.9

Examinations of legs of beef have shown that the decrease of the percentage of bone continues sensibly with the increase of the weight of the animal.

With wethers the following figures were obtained :

		Percentages	
		Extremes	Average
9 animals	weighing less than 22 lbs.	24.3 — 36.1	31.7
5 "	" " between 22 and 44 lbs. . .	22.3 — 36.4	29.8
3 "	" upwards of 44 lbs.. . . .	15.2 — 18.4	16.75

The results obtained appear constant with calves, grown up cattle, and sheep, and may be summarized as follows: the proportion of bone to the total weight of the animal varies inversely with the age, the quality and the weight.

PLANT DISEASES

GENERAL INFORMATION.

Diseases and Pests Legislation in Ceylon. — PERCH, T. in *Department of Agriculture, Ceylon, Bulletin* No. 6, pp. 79-93. Colombo, 1913.

At the present time there are in Ceylon two Ordinances dealing with plant diseases and preventing the introduction of others. It was not till 1901 that some simple form of legislation was considered necessary to regulate the importation of plants and seeds. Before then there was no law dealing with plant diseases, while other tropical colonies were taking measures against the coffee leaf disease in Ceylon. Since then progress has been rapid, and Ceylon has outrun other tropical countries in adopting a special Ordinance to provide against diseases occurring in the colony.

The writer gives the full text of the legislative provisions concerning plant diseases as outlined in "Ordinance No. 5. of 1901" entitled "An Ordinance to make provision for preventing the introduction and spread of Insect or Fungous Pests or Plant Diseases", known as "The Plant Pest and Quarantine Ordinance". Next follow the various regulations in connection with the said Ordinance extending over the period 1901-1912 to prevent the introduction into Ceylon of fungus diseases and animal pests from other regions and for the institution of a Fumigating Station.

As a result of the regulations already in force, the importation of cacao beans from the Dutch East Indies and pepper from India is absolutely prohibited. All plants, bulbs, etc., except those imported for local consumption, oranges and other citrus fruits and cotton seeds, are subjected to fumigation by means of hydrocyanic acid, unless certified as having been previously subjected to such treatment. Tea seeds are disinfected by means of formalin vapour. During 1912, 1148 cases of oranges and lemons, 4977 cases of tea seeds and 565 consignments of bulbs, plants, etc., were fumigated.

Internal Legislation was contemplated in "Ordinance No. 6 of 1907", known as "The Plant Pests Ordinance of 1907", of which the whole text is given, representing the result of discussions held by those affected during previous years. The "Ordinance" is accompanied by certain Proclamations issued at various times during 1907 to 1913 describing the methods of control-

ing fungus diseases and insect pests. Since these Proclamations have not been repealed, power has been given to the Plant Pests Board, set up in each district by the "Ordinance of 1907" to take steps for the control of coconut beetles, in particular *Rhynchophorus signaticollis* (the red coconut beetle) and *Oryctes rhinoceros* (the black coconut beetle) against the stem-bleeding disease of the coconut (*Thielaviopsis ethacetica*), against the shot-hole borer (*Xyleborus formicatus*) and Hevea canker (*Phytophthora Fadeni*).

286 — List of Proclaimed Noxious Weeds in Tasmania. — *The Agricultural Gazette of Tasmania*, Vol. XXI, No. 11, p. 437. Hobart, 1913.

Botanical name	Local name	When proclaimed
<i>Cnicus arvensis</i> Hoffm.	Californian thistle	29 Oct. 1883
<i>Xanthium spinosum</i> L. (1).	Bathurst burr	20 Dec. 1887
<i>Lepidium Draba</i> L.	White weed	29 Oct. 1908
<i>Cryptostemma calendulaceum</i> Br.	Cape weed	31 Aug. 1909 17 Nov. 1909 20 Dec. 1910 11 May 1911
<i>Achillea Millefolium</i> L.	Great burdock	1 July 1910
" minus Bernh.	Lesser burdock	
<i>Asphodelus fistulosus</i> L.	Wild onion	29 Sept. 1910
<i>Brassica Sinapis</i> Boiss.	Charlock	20 Dec. 1910*
<i>Conium maculatum</i> L.	Hemlock	3 Feb. 1911
<i>Echium vulgare</i> L.	Viper's bugloss	4 March 1912
<i>Dipsacus sylvestris</i> Mill. (2).	Teazel	21 March 1912*
<i>Anthemis Cotula</i> L. (3).	Stinking mayweed	27 March 1913*
<i>Carduus pycnocephalus</i> Jacq. (4).	Slender or shore thistle	14 Oct. 1913*

* Proclaimed only in certain municipalities.

287 — *Carduus pycnocephalus* a Proclaimed Weed in Tasmania. — BLACK, A. in *The Agricultural Gazette of Tasmania*, Vol. XXI, No. 11, pp. 430-435, figs. 1-4. Hobart, 1913.

As the outcome of a strong recommendation made by the Clarence Board of Agriculture to the local Council, the slender thistle (*Carduus pycnocephalus*) was proclaimed a noxious weed under Section 6 of the Local Government Act, 1906.

This species has been found in many parts of Tasmania, particularly near the coast or even growing on the beach, whence the name of "shore

(1) See also No. 1403, B. Dec. 1913. — (2) See No. 1363, B. Sept. 1912. — (3) See No. 1096, B. Sept. 1913. — (4) See below, No. 287. (Ed.)

istle " sometimes given to it. If left undisturbed it will grow with great rapidity and spreads very quickly owing to the various ways by which its seed is dispersed. Repeated observations show that cattle only eat it accidentally mixed with other fodder, or in times of shortage.

In consequence of the law it is incumbent upon the municipality of Murrumbidgee to take action for its eradication. Section 3 of " The Californian Thistle Act, 1883 " (47 Vict. No. 17), as read with Subsection XII of Section 130 of " The Local Government Act, 1906 " provides : — " If any occupier of land within (the Municipality of Clarence) upon which land (Slender Thistle) shall be growing at any time shall not effectually cut down all such slender Thistle, so as to prevent the same from blossoming, every such occupier shall be liable to a penalty not exceeding Twenty Pounds ".

Section 3 of " The Californian Thistle Act Amendment Act, 1887 " (Vict., No. 29), as read with Subsection XII of Section 130 of " The Local Government Act, 1906 ", forbids the removal or sale of hay, straw, grass seed or any kind of grain containing seeds of slender thistle.

Finally " The Federal Quarantine Act " prohibits the importation of any plant or its seeds from any part of the world into the Commonwealth of Australia under a severe penalty.

DISEASES NOT DUE TO PARASITES AND OF UNKNOWN ORIGIN.

- On "**Kroepoek**" of Tobacco in Kamerun. — LUDWIGS, KARL in *Berichte der deutschen botanischen Gesellschaft*, Vol. XXXI, Part 9, pp. 536-543, figs. 1-3. Berlin, 1913.

In the spring of 1913, a tobacco disease which had already appeared in the previous spring, and was known to tobacco cultivators under the name "Kräuselkrankheit" (leaf curl), was very prevalent in Njombe. From observations made on the spot, the writer ascertained that the disease in question was not the true "Kräuselkrankheit", but "Kroepoek", which at first sight appears very similar to the former affection; according to Peters it occurs in Java, and more rarely in Sumatra, while it is properly present in Ceylon. The cause of this disease, together with the means of its control, have so far not been discovered.

Already on the young plants the central leaves are seen to develop abnormally, since instead of assuming a vertical position as in healthy plants, they curve partially, rotating horizontally. The upper surface of the leaves has a wrinkled appearance, while the nerves on the lower surface are specially marked and show on their margins excrescences of dark green colour. The leaves no longer develop normally in length, but give the impression of being contracted into themselves; further, they are not straight, but twisted, and subsequently the interposed foliar tissue forms protuberances which are directed upwards. In the older leaves, the excrescences have the appearance of leaflike appendices, having an anatomical structure different from that found in the normal organ. The size and shape of these outgrowths vary, but they are always connected with the principal nerves,

or with the more marked secondary ones. The development in length of the whole plant is arrested, infected individuals only attaining to about one third of their normal height, while their leaves are valueless to the grower.

Microscopic investigations have not revealed the presence of any bacteria, fungi or insects. Various experiments were also made with potash manures; these, however, gave no results. The soil upon which the tobacco plantations have been made consists of decomposed basalt and is very fertile. The alternation of good with bad crops (from the autumn of 1911 in which the first sowings were made, until the spring of 1913), according to whether the tobacco was planted after the rains, or at the close of the dry season, an alternation which was proved to occur not only at Njombe, where there are the oldest and largest tobacco plantations, but also at Mbanga and Ebunje (Ebinse), strengthened the writer's belief that the degree of humidity of the soil exercises an influence upon the appearance of "Kroepoek" in so far that it is a physiological disease depending on disturbance in the nutrition of the plant. These disturbances, in the opinion of the writer, are connected with the peculiar structure of the soil. The subsoil of the plantations attacked by the disease consists of masses of rock of various size covered by a stratum of fine volcanic ashes, which at Penja attains a depth of about 20 m. (66 ft.) These ashes, although in themselves very fertile, possess the disadvantage of being permeable to water to an extraordinary degree. The sources of all the streams in the district are situated at great depths, and occur at the spots where the masses of rock crop out. It is impossible to dig a well in the plantations on account of the red subsoil.

This peculiar structure of the ground prevents deeply seated water from reaching the surface by capillarity; to this must be added the method by which the soil is prepared previous to the planting of the tobacco. The district is covered by a thick virgin forest which assures to the soil a certain amount of moisture. In order to make a tobacco plantation, it is necessary to fell the virgin forest and completely clear the ground, working it repeatedly. It is easy to understand that the soil loses the greater part of its moisture during these operations, especially in the dry season, and dry soil, as is well known, only acquires moisture with great difficulty. Such are the conditions under which the tobacco plantations occur. After the first felling of the forest, which usually took place towards the close of the dry season, the soil still held sufficient moisture; the atmospheric precipitations of the rainy season followed, and a good crop resulted. Afterwards, the soil was exposed to the sun, the water evaporated without being replaced and the plants consequently became diseased.

According to the writer, the appearance of the disease may be explained as follows. The tobacco plants are first grown in seed plots, whence they are later transplanted to the field. In order to facilitate their taking root they are generally watered, so that they may continue growing and attain a certain height. After this, the watering is suspended, and the plants are left to themselves. In this condition they form organic substances

in leaves, through assimilation, but they no longer receive mineral substances from the ground, as the necessary water is lacking. Consequently, water-conducting vessels do not develop normally, the leaves become curled, and the excess organic substances are used in the formation of excrescences and the appendices which are observed on the leaves.

It is noteworthy that, at least according to the researches hitherto made, the plant which has once become diseased never regains its normal development, even if subsequently supplied with water.

The observations made exclude the possibility of affected plantations yielding any crop the same season.

In 1913, the writer advised for the control of the disease, the covering of the soil, after clearing it, with about 18 inches of cut grass; this decomposes forming humus, and thus preserves the moisture for a long time. The results of these experiments are awaited with interest. In any case it would be foolish to abandon tobacco growing, even if a bad harvest is obtained after a moderately wet rainy season, such as was experienced in 1913.

In the Esosung plantations, on the other hand, the soil is also volcanic, as it contains clay it retains water better. Further, the humidity of the air is such that the soil cannot possibly dry up. In this district, the disease has not made its appearance, and it is possible to plant two tobacco crops in the year.

The writer states, in conclusion, that "Kroepoek" does not only attack tobacco, for he has met with it to a considerable extent also upon plants known as "makabo" (*Colocasia antiquorum*) growing upon dry soil near the village of Lum. Doubtless the disease could also be recorded as attacking other plants.

- On the Pathological Significance of Endocellular Fibres in the Tissues of the Vine (1). — MAMELI, EVA in *Atti dell'Istituto botanico dell'Università di Pavia*, series II, Vol. XVI, pp. 41-45. Milan, 1913.

According to what is reported in this second note on the subject (the full results of the complete investigations will be published later) the research for endocellular fibres in the healthy tissues of numerous species of perfectly healthy dicotyledons has given the writer positive results.

Further, more or less numerous endocellular fibres have been found in the tissues of healthy vines which have been cultivated under the most diverse climatic conditions, from a mountain 650 metres (2170 ft.) above sea-level down to a hot-house.

Contrary to the opinion of Petri, it seems evident, according to the writer, that no correlation exists between the presence of endocellular fibres and any pathological condition of the plant containing them, nor is there any connection between this phenomenon and falls of temperature.

BACTERIAL AND FUNGOID DISEASES.

- 290 - **The Hereditary Transmission of Rust in Hollyhock (*Althaea rosea*).** BLARINGHEM, L. In *Comptes-Rendus hebdomadaires des Séances de l'Académie des Sciences*, Vol. 157, No. 26, pp. 1536-1538. Paris, December 29, 1913.

Seeds of *Althaea rosea* sterilised externally and grown in sterile tu containing Knop's solution (either liquid or solidified by Japanese ising) gave rise to plants quite free from pustules of hollyhock rust (*Puccinia Malvacearum*). The addition of 5 per cent. of glucose to the nutritive solution caused the appearance of pustules on the cotyledons several days before they withered off. An addition of 5 per cent. of saccharose gave rise to vigorous plants, and the pustules appeared on the first leaf when it was drying off. The supply of glucose and saccharose was arranged so that plants were in a medium physiologically poor in water (Schimper). The writer considers that the above results can only be attained when the imbibition is as intense as the walls of the vessel will permit.

- 291 - **The Fungi causing Straw Blight of Wheat in France.** (1) — PROSZY, J. *Comptes-Rendus hebdomadaires des Séances de l'Académie des Sciences*, 1913, 2nd year, Vol. 157, No. 22, pp. 1079-1081. Paris, 1913.

Straw blight in France has so far only been considered in connection with wheat; it has been regarded by Prillieux and Delacroix as due to *Ophiobolus graminis* Sacc., although Mangin and Fron consider the pathogenic agent to be almost exclusively *Leptosphaeria herpotrichoides* De Not. In Central Europe, and more especially in Germany, it is caused by *O. herpotrichus* (Fries) Sacc. is chiefly responsible for straw blight in wheat and barley, while *L. herpotrichoides* produces straw blight in

The presence in France of *O. herpotrichus* has not been recorded by observers of straw blight, with the exception of Delacroix who mentions it incidentally, and the part played by this species in the development of the disease in that country has not been investigated. Nevertheless, *O. herpotrichus* was almost the only species observed by the writer in the district of Toulouse in 1912-1913. In particular, this fungus caused much damage at Saint-Jory and at Ondes (Haute-Garonne). The writer almost invariably found it alone on diseased wheat straw from Causse (Lot-et-Garonne) and Castillonnes (Lot-et-Garonne). He is of opinion that *herpotrichus* is also present in other grain-growing districts of France and in fact, it was recorded in Poitou and from various places in the Centre Inférieure in 1856 and 1884 respectively, throughout the Vosges in 1845, and frequently near Paris (at Versailles and Fontainebleau) in 1912.

In the season of 1912-13 *O. graminis* took the place of *O. herpotrichus* in the neighbourhood of Queyssac (Dordogne). In all the above-mentioned places *L. herpotrichoides* has rarely made its appearance. Mangin, and subsequently Fron, have, however, found this species abundant elsewhere

(1) See also No. 77, B. Jan. 1914.

Wheat straw blight in France is there fore usually due to one of the three following species: *O. graminis*, *O. herpotrichus*, *L. herpotrichoides*. It would be premature to state the relative importance of these three fungi as biogenic agents. Further, there is no proof that the species which predominates in a district at any given moment will always predominate here.

Hence it results that the name of "piétin" is in fact given to three different diseases, and this confusion in nomenclature gives rise to serious difficulty, since it causes the confusion of facts. The three straw blights possess as their common characteristic the habit of invading the base of the plants, but the study of their life-history is too little advanced for it to be possible to determine with any certainty the points in which they differ from one another.

It has already been observed that their organs of reproduction are not used at the same time, and that the different species have a preference for wheat, rye or barley respectively. The writer adds that oats, which, according to Mc Alpine and Robinson, are immune to *O. graminis*, have in the neighbourhood of Ondes been very severely attacked by *O. herpotrichus*. Without doubt, these are not the only differences; they are, however, sufficient to show that each straw blight should be studied independently of the others.

INSECT PESTS.

— **The Insect Fauna of the Soil.** — CAMERON, ALFRED E. in *The Journal of Economic Biology*, Vol. 8, No. 3, pp. 159-204, plates I-II, figs. A-C. London, September 9, 1913.

The writer has made a thorough investigation of the insects inhabiting the soil of a grass field attached to the Economic Zoology Laboratory of the University of Manchester. The surface soil is much mixed, but is everywhere underlain by stiff clay. Much of the area was dug over to a depth of 1 to 2 feet, and carefully sifted.

The herbage of the field was composed of a number of grasses and weeds, and a large number of insects found feeding on the roots of the useful grasses and weeds were as follows:

His glomerata: *Hepialus humuli*, *Leucania comma*.
His aurivinctula and *F. elatior*: *Dolerus gonager*, *D. haematodes*, *D. picipes*.

His annua and *P. pratensis*: Cecidomyiidae, Mycetophilidae, Tipulidae (prevalent *Dicranomyia chorea*, *Trichocera hiemalis*, *Pachyrhina impervialis*, *Tipula oleracea*), Bibionidae (especially *Dilophus febrilis*; also *Bibio hortulanus*, *B. laniger* and *B. johannis*); Muscid Diptera (*Onesia sepulchralis*, *Pollenia rudis*, *Hyetodesia incana*, *H. populi*); Elateridae; *Otiorrhynchus picipes*, *O. sulcatus*, *Barynotus obscurus*; various species of Noctuidae (*Triphaena*, *Xylophasia*, *Hadena*, *Hydroecia*).

Phleum pratense: *Apamea gemina*.

Trifolium pratense and *T. dubium*: *Agrotis corticea*.

Those on roots of weeds were chiefly Noctuids (*Leucania*, *Apamea*, *Triphaena*, *Agrotis*, *Xilophasia*, *Mamestra*).

In breeding the various insects found in the soil, a number of parasites were reared; the following are from new hosts: *Homocidus dimidiatus* Schr. and *H. tarsatorius* Panz. (Ichneumonidae, Tryphoninae) from pupae of *Platychirus albimanus* F. (the host being useful in the larval stage in destroying *Pterocallis tiliae*, the aphid of lime trees); *Phaeogenes* (Ichneumonidae, Ichneumoninae) from pupae of *Chrysopa vulgaris* (also useful in destroying lime aphids).

In the second part of his article the writer mentions that to most insects clay is unfavourable, as it hinders their movements; this is particularly the case with active larvae like those of the predaceous Carabids and Staphylinidae, while wireworms and leather-jackets seem to thrive in heavy clays. The question of aeration is of importance in this connection; most insects remain near the surface (out of the 140 species found in the field hardly 20 occurred at depths below 6 inches), but the larvae of *Hepia humuli* burrow down as deep as 18 inches to pupate.

Stagnant water destroys the majority of insects; an exception is provided by the larvae of *Agriotes lineatus* (wireworm), which in the writer's experiments were alive after immersion in water for six days, though nearly all were dead after eight days.

Many insects burrow deep into the soil during cold weather; but others remain dormant near the surface; larvae of *Triphaena pronuba* and *Agriotes segetum* and of certain Muscids found in frozen soil recovered indoors eventually completed their metamorphoses.

The article is accompanied by a bibliography referring to a large number of works.

293 - **A List of Uganda Coccidae and their Food-Plants.** - GOWDEY, C. *Bulletin of Entomological Research*, Vol. IV, Part 3, pp. 247-249. London, November 1914.

The climate and the luxuriant vegetation of Uganda render it a particularly favourable country for the development of insect life. In growth and multiplication are therefore continuous throughout the year. This is especially true with regard to the Coccidae.

Many of the forty-nine species enumerated by the writer have been found upon cultivated plants:

<i>Icerya</i> sp.	Orange.
<i>I. caudatum</i> .	Crotons.
<i>I. seychellarum</i> Westw.	<i>Monodora myristica</i> and <i>Eranthemum</i> b.
<i>Dactylopius</i> sp. nov.	Unknown shrub.
<i>D. (Pseudococcus) citri</i> Risso.	Coffee, orange and lemon and an unknown shrub.
<i>Tachardsea decorella</i> Mash.	<i>Anona muricata</i> .
<i>T. longisetosa</i> Newst.	Bark-cloth tree (<i>Ficus Sycomorus</i>).
<i>Pulvinaria</i> sp. nov.	<i>Tecoma stans</i> .
<i>P. jacksoni</i> Newst. (Parasitized by <i>Tetrastichus gowdeyi</i> Crawl.).	Cotton.

sidi Mask.

plastes sp.
plastes sp. nov. (two).
tricanus Green.
trifarius And.

majoris Newst.
curvator Newst.
rus Newst.
oleatus Newst.
undulatus Newst.

lingularis Newst.
gandae Newst.
insonoides Newst.
isia conchiformis Newst. (parasitized by
adonia scintilla Ramb.).
phastodes gomdeyi Newst.
missum africanum Newst.
hirculium Sign.
(*Eulcanium*) *filamentosum* Newst.
(*Eulcanium*) *somerens* Newst.

ecus *hesperidum* L.
issida *nigrum* Nietner.
issida *oleae* Bern.
vinabulum Newst.
ide Green (preyed on by *Chilocorus*
oides and *C. punctata*).
ecus dimorphus Newst. (parasitized
Eullemma costimacula Saalm.).

ideyi Newst.
aspis cassiae Newst.
vilobis Newst.
striata Newst.
is (*Aulacaspis*) *chionaspis* Green.
ularis Newst.
lotus cyanophyllis Sign.
loniae Comst.
edeyi Newst.
insparans Green.
ibiformis Green.
leaphes beckett Newm. (*citricola* Pack).
aspis bififormis Dougl.
aspis africana Newst.

Coffee, *Funtumia elastica*, guava, tea, *Alseodaphne verticillata* and *Markhamia platycalyx*.

Guava.
Bark-cloth tree.
Acacia sp. and *Cajanus indicus*.
Antigon leptopus, orange, coffee, *Funtumia latifolia*, tea, cauna, croton, Agave, Hibiscus and bark-cloth tree.

Ficus sp.
Guava.
Bark-cloth tree.
Coffee and bark-cloth tree.
Anona muricata and Nsambyia (*Markhamia platycalyx*).

Guava.
Acacia sp. and *Anona muricata*.
Baobab *emini*, coffee and guava.
Anona muricata and *Harrogonia madagascariensis*.

Bark-cloth tree.
Coffee.
Albizia sp. and *Cajanus indicus*.
Unknown forest shrub.
Mulberry, *Tecoma stans*, and *Markhamia platycalyx*.

Orange.
Ficus sp. and *Anona muricata*.
Chlorophora excelsa.
Elephant grass and lemon grass.
Coffee and guava.

Cajanus indicus, cacao, *Croton tiglium*, *Anona muricata*, *Markhamia platycalyx* and mulberry.

Harrogonia madagascariensis and coffee.
Cassia floribunda.
Palms and *Sapium mannianum*.
Palms.

Sapium mannianum and *Cassia floribunda*.
Chlorophora excelsa.

Guava, palms.
Guava.
Anona muricata.
Tea.
Oleander.
Orange, lemon.
Palms and bamboo.
Unknown forest shrub.

Diaretus (Aphidius) obsoletus n. sp., a Braconid Parasitic upon the Aphides *Brachycolus noxius* and *Toxoptera graminum*, injurious to cereals in Russia. — KORDJUMOV, N. in *Revue Russe d'Entomologie*, 1913, Vol. XIII, No. 1, pp. 23-26, 1 fig. St. Petersburg, 1913.

A systematic description of this new Braconid (Hymenoptera), which been studied at the Experimental Station of Poltava and is regarded by writer as an important parasite of *Brachycolus noxius* Mordwilko and *Toxoptera graminum* Rondani.

In Europe *D. obsoletus* takes the place of the American parasite *Toxoptera*, *Lysiphlebus tritici* Ash.; it is near *Aphidius dauci* Marshall from which it differs in certain morphological characters. Most probably the parasite in question is a species confined to Southern Europe.

295 - **Insects and Mites Injurious to Cultivated Plants in France.** - NOEL, Paul, in *Bulletin trimestriel du Laboratoire d'Entomologie Agricole de la Seine Inférieure*, 1914, Quarter 1914 (January-February-March), pp. 3-11. Rouen, 1914.

About 286 species of plants are cultivated in France; amongst these may be enumerated 16 kinds of fruit trees, 28 horticultural plants, 31 forage and cereal plants, 14 forest trees, 32 ornamental trees and shrubs, 84 ornamental plants and 91 medicinal plants. Each of these species has several enemies amongst insects and mites; the number of these enemies amounts to 1078 for oak, while for 25 other plants it reaches over a hundred.

The writer, who has studied agricultural entomology for forty years, has drawn up from the results of his own observations, and from data given in various works which have appeared in France from 1860 until the present day, some statistical tables for each of the seven categories of plants mentioned above. These show that the 286 kinds of plants which are cultivated in that country are attacked by as many as 12008 insects (Coleoptera, Orthoptera, Hemiptera, Neuroptera, Hymenoptera, Lepidoptera, Diptera) and mites, the numbers being divided as follows:

	No. of injurious insects or mites.
16 fruit trees	1 671
28 horticultural plants	704
31 forage and cereal plants	988
14 forest trees	4 637
32 ornamental shrubs and trees	1 109
84 ornamental plants	1 029
91 medicinal plants	1 870
Total 286 cultivated plants	12 008

296 - **The Life-History of *Aphis euonymi*, Injurious to Sugar Beets** (1). GAUMONT, L. in *Comptes-Rendus hebdomadaires des Séances de l'Académie des Sciences*, 1913, 2nd Half-year, Vol. 157, No. 22, pp. 1092-1094. Paris, 1913.

The writer, having found *Aphis euonymi* to be very abundant on the beets growing in the neighbourhood of Montargis (Loiret, France), set himself the task in 1912 and 1913 of verifying the results of the investigation made in Russia in 1909 by Mordwilko, and determining whether this aphid passes the winter only in the egg condition, and solely upon *Euonymus europaeus* and *Viburnum Opulus*, or whether it possesses some other method of hibernating.

In the Orleans public gardens the writer observed in 1912 and 1913 that *A. euonymi* was often very abundant on *Euonymus japonicus*.

(1) See also No. 395, B. July 1913.

In order to protect the beets, it would therefore not be sufficient, as has been maintained, to destroy *E. europaeus* and *V. Opulus*, but it would be necessary also to sacrifice *E. japonicus*, which is a very common shrub in public parks and gardens.

Further, according to the writer, this measure would not be all that required, for at the end of October 1913, he observed beets still attacked by the aphids at St. Germain des Prés (Loiret). On the lower surface of the leaves were found wingless and winged parthenogenetic individuals, as well as sexual ones. The writer was able to collect a certain number of paired insects and oviparous females in the act of depositing their eggs at the base of the stems of the beets. When the latter are harvested the neck is left intact, or the leaves are stripped off, if they are used as forage; then the beets are stored in silos or cellars. The eggs can thus remain upon the leaves and hatch out in the silos or cellars; the aphids then find their way through the ventilating apertures, spread in spring to *Rumex*, *Chenopodium* or other wild plants, and thus form centres of infection. If these insects are used for seed, the insects can easily found a new colony upon the plants on which they were hatched. On the other hand, young beets which are too small to be taken are often left in the ground; these resist mildew, and if they contain eggs, can easily in the spring become centres of infection.

- *Aleurodes vaporarum*, a Parasite of *Azalea indica* in Belgium (1).

- VAN HOVE in *Revue de l'Horticulture Belge et Etrangère*, Vol. XXXIX (Vol. IX, 10th Series), No. 24, pp. 392-393. Ghent, 1913.

This insect, which is well known to Belgian azalea growers under the name of "mouche blanche", was very abundant in the autumn of 1913. According to the writer, it is necessary to have recourse to every method of destroying this pest, if the prohibition of the export of *Azalea indica* is to be avoided.

After having given some information regarding the life-history and habits of this parasite, and of the damage caused by it, the writer enumerates the preventive and curative measures to be adopted:

1) Fumigation with tobacco in the greenhouse; 2) spreading naphthalene on heated plates in the greenhouse; 3) watering of azaleas planted in the open with a mixture of soft soap, naphthalene, petroleum and tobacco juice; 4) immersing the plants in a bath of lime water and insecticide; 5) immersing the plants in a solution of soft soap and insecticide in the following proportions: 18 oz. soft soap, 1/2 oz. insecticide powder, and 10 gallons of water; 6) the specialities recommended by the trade may be taken into serious consideration.

